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OU2 REMEDIAL INVESTIGATION REPORT

Volume IV: Appendix B
Draft Final BERA

SHIELDALLOY METALLURGICAL SUPERFUND SITE
NEWFIELD, NEW JERSEY

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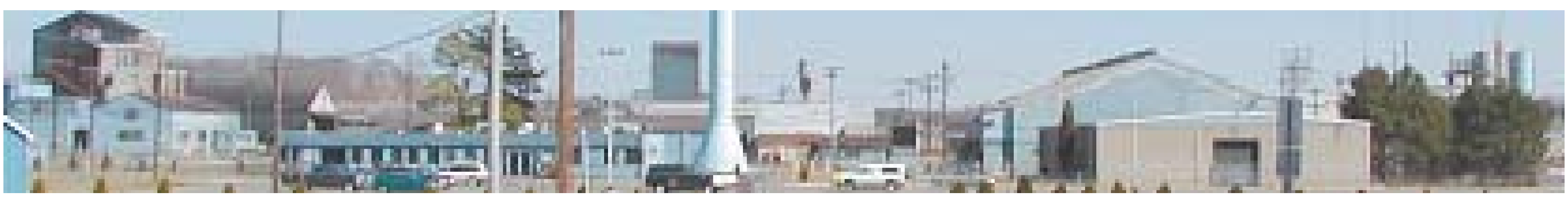

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Draft Final OU2
Baseline
Ecological Risk Assessment

Shieldalloy Metallurgical Corporation
Superfund Site
Newfield, New Jersey

Prepared for:

U.S. Environmental Protection Agency
Region 2
New York City, New York

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LIST OF ACRONYMS

AOC	Administrative Order of Consent
BAF	Bioaccumulation Factor
BERA	Baseline Ecological Risk Assessment
COPEC	Contaminant of Potential Ecological Concern
CSM	Conceptual Site Model
Eco-SSL	Ecological Soil Screening Level
ER-L	Effect Range – Low
ER-M	Effect Range - Median
HI	Ecological Hazard Index
HQ	Ecological Hazard Quotient
ER-L	Effects Range – Low
ER-M	Effects Range - Median
LEL	Lowest Effect Level
LOAEL	Lowest Observable Adverse Effect Level
MATC	Maximum Acceptable Toxicant Concentration
mg/kg BW-day	milligrams per kilogram body weight per day
mg/kg	milligrams per kilogram
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollutant Discharge Elimination System
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observable Adverse Effects Level
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl

LIST OF ACRONYMS (Continued)

PCOPEC	Preliminary Contaminant of Potential Ecological Concern
PEC	Probable Effect Concentration
PEL	Probable Effect Level
PRG	Preliminary Remediation Goal
SEL	Severe Effect Level
SMC	Shieldalloy Metallurgical Corporation
SMDP	Scientific/Management Decision Point
SQL	Sample Quantification Limit
SLERA	Screening-Level Ecological Risk Assessment
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Total Compound List
TEC	Threshold Effect Concentration
TEL	Threshold Effect Level
TOC	Total Organic Carbon
TRC	TRC Environmental Corporation
TRV	Toxicity Reference Value
VOC	Volatile Organic Compound
UCL	Upper Confidence Level
ug/kg	micrograms per kilogram
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1.0 INTRODUCTION

This Baseline Ecological Risk Assessment (BERA) for Operable Unit 2 (OU2) is submitted for the Shieldalloy Metallurgical Corporation (SMC) Superfund Site (Site) in Newfield, New Jersey. TRC Environmental Corporation (TRC) and SMC executed the Administrative Order on Consent (AOC) for the Site with the U.S. Environmental Protection Agency (USEPA) on April 28, 2010. The AOC defined the following OUs:

- OU1-Non-Perchlorate Ground Water;
- OU2-Non-Perchlorate Soil, Sediment, and Surface Water; and,
- OU3-Perchlorate, all media.

OUs 1 and 3 are addressed in other Site documents.

TRC's approved OU2 Revised Screening Level Ecological Risk Assessment (Revised SLERA, TRC, 2011). The revised SLERA satisfied Section III Task VII.B of the AOC's Scope of Work and included a workplan to collect ecological data and perform a BERA. This BERA fulfills that work.

The OU2 Draft Site Characterization Summary Report (Draft SCS Report) discusses Site data at length. The Draft SCR Report is submitted concurrently with this BERA.

The objective of this BERA is to evaluate whether contaminants present on the Site and identified as Contaminants of Potential Ecological Concern (COPECs) during the SLERA may adversely impact biota. This ecological risk assessment was conducted in accordance with the following U.S. Environmental Protection Agency (USEPA) guidance:

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA/540/R-97-006. June 1997 (USEPA, 1997).

- Guidelines for Ecological Risk Assessment. EPA/630/R-958/002Fa. May 1998 (USEPA, 1998).

The USEPA (1997) document outlines an 8-step process, including numerous scientific/management decision points (SMDPs), for evaluating potential risks to potential receptors. A SLERA (Steps 1 and 2) was previously conducted for the Site (TRC, 2011) and was intended to allow a determination as to whether the Site either poses no ecological risks, or to identify which contaminants and exposure pathways require further evaluation. Because of the conservative assumptions used during Steps 1 and 2, some preliminary contaminants of potential ecological concern (PCOPECs) may pose negligible risk. Therefore, in Step 3A of the SLERA, further evaluation of the assumptions used and other site-specific information were considered to refine the PCOPECs and establish a final list of COPECs.

This BERA provides introductory information in Section 1. The remainder of this BERA is organized as follows:

- Section 2 formulates the risk assessment problem, including a more thorough review than provided in the SLERA of the toxicity and fate/transport mechanisms associated with each of the COPECs, the identification of complete exposure pathways and ecosystem/receptors at risk. The selection of assessment and measurement endpoints and a conceptual model are also presented in this section.

- Section 3 provides the sampling rationale as well as the results of the additional sampling to evaluate the measurement endpoints.

- Section 4 evaluates biota exposed to Site COPECs using the information obtained during the additional sampling and characterizes risk to ecological receptors inhabiting the Site.

- Section 5 presents a summary and the proposed preliminary remediation goals (PRGs).

- Section 6 provides and a list of references cited in the BERA.

Supporting tables, figures, and appendices are also included.

1.1 Basis of the BERA

The Revised SLERA forms the basis of this BERA. Step 3A of the Revised SLERA concluded that surface water and/or sediment concentrations of various metals including chromium, vanadium, aluminum, copper, iron, lead, manganese, mercury, nickel and/or zinc may pose a potential risk to the aquatic invertebrate community present within the Hudson Branch. In addition, avian/mammalian herbivores (represented by the mallard and muskrat) are potentially at risk from sediment concentrations of chromium that may bioaccumulate within aquatic vegetation. Mammalian insectivores (represented by the little brown bat) may be at risk from the modeled concentrations of antimony, chromium and vanadium within the tissues of aquatic invertebrates that may be consumed by foraging bats. Avian insectivores (represented by the tree swallow) are potentially at risk from sediment concentrations of barium, chromium, copper, mercury and vanadium that may bioaccumulate in aquatic invertebrates. In summary, COPECs retained for the aquatic habitat provided by the Hudson Branch that required further evaluation include aluminum, antimony, barium, chromium, copper, iron, lead, manganese, mercury, nickel, vanadium and zinc.

The Revised SLERA also concluded that surface soil concentrations of manganese, nickel and vanadium at the eastern storage areas and the concentrations of vanadium in surface soils of the southern area and Hudson Branch wetland may present a potential risk to the plant communities inhabiting these areas. Manganese, nickel and vanadium were retained as COPECs requiring further evaluation regarding potential impacts to the plant communities within these respective areas.

The potential risks to terrestrial wildlife indicator species foraging at the former lagoons area, eastern storage areas, southern area and the Hudson Branch wetland were evaluated in the

Revised SLERA. The surface soil concentrations of chromium and vanadium may present a risk to avian and mammalian insectivores (represented by the American robin and short-tailed shrew) that forage at the eastern storage areas. Therefore, chromium and vanadium were retained as COPECs for the eastern storage area and were evaluated further in this BERA. Surface soil concentrations of chromium may pose a risk to foraging avian and mammalian insectivores at the Hudson Branch wetland while detected concentrations of vanadium provide a potential risk to foraging avian insectivores. These PCOPECs were retained as surface soil COPECs for the Hudson Branch wetland and are further evaluated in this BERA.

1.2 Basis of Data

The Draft SCS Report describes the 2011/2012 collection and results of supplemental sampling work to collect additional data for OU2. The Revised SLERA was based on data available at that time. This BERA incorporates the new data. This BERA includes surface water and sediment data collected from 2009 to 2012 as these samples would best represent current conditions within the Hudson Branch. In addition, this BERA includes the recent sediment data from the on-Site impoundment area (i.e., drainage basin).

Surface soil data recently collected include samples located above the streambank associated with the Hudson Branch as well as co-located surface soil and terrestrial invertebrate samples. These data, as well as the historic available data presented in the SLERA were used to evaluate risk to terrestrial receptors in the BERA.

Additional data that was recently collected and incorporated in the BERA include tissue samples of aquatic vegetation and aquatic and terrestrial invertebrates as well as sediment toxicity testing results. The sampling rationale and collection methods were previously detailed in the BERA Scope of Work that was presented in the Revised SLERA (TRC, 2011).

2.0 PROBLEM FORMULATION

The Problem Formulation consists of an evaluation of the following:

- Environmental Setting and Potential Receptors;
- Contaminant Ecotoxicity;
- Contaminant Fate and Transport;
- Complete Exposure Pathways;
- Assessment Endpoints; and,
- Conceptual Site Model.

The Environmental Setting and Potential Receptors section briefly describes habitats present at or near the Site and identifies potential receptor species. This information was previously presented in the Revised SLERA (TRC, 2011) and is briefly summarized in this section. The results of a review of the literature on the ecotoxicity and fate and transport mechanisms of the selected COPECs identified at the Site are presented. Complete exposure pathways are also identified. The results of these components are then used to develop the proposed assessment endpoints and a conceptual site model.

2.1 Environmental Setting and Potential Receptors

The SMC Facility comprises approximately 67.7 acres in Newfield and Vineland, New Jersey, which are in Gloucester and Cumberland Counties, respectively. SMC also owns 19.8 acres of farmland in Vineland, New Jersey, within Cumberland County. This 19.8 acre parcel is approximately 2,000 feet southwest of the SMC Facility. SMC purchased the Farm Parcel to facilitate groundwater remediation, which includes a pumping well at this location. This Farm Parcel has never been used for manufacturing or related activities. A site location map is provided in Figure 2-1.

The SMC Facility is located approximately five miles to the west of the New Jersey Pinelands National Reserve. The Pinelands is distinctive for the widespread occurrence of dry pine, oak, and heath communities in a humid, temperate, deciduous forest climate. The Site is characterized by sandy unconsolidated soils, flat to gently sloping terrain, and vegetative and wetland types that are similar to the nearby Pinelands. The Hudson Branch flows along the southern portion of the Site, with its headwaters located to the east. The headwaters of the Hudson Branch are characterized by an extensive wetland that develops into a ponded area, from which the Hudson Branch flows along a stream course along the southern border of the site. The Hudson Branch is a tributary to Burnt Mill Pond, from which the Burnt Mill Branch flows to the Maurice River. Since the Hudson Branch eventually flows into the upper portion of the Maurice River, it receives the FW2-NT (Category II) classification. Several aquatic, wetland and terrestrial habitats are present at the SMC Facility or in association with the Hudson Branch. These habitats consist of perennial stream (Hudson Branch), ponds (ponded portions of the Hudson Branch), palustrine emergent marsh, palustrine scrub-shrub wetland, palustrine forested wetland, forested upland and maintained grassland areas. In addition, disturbed areas that are devoid of vegetation are present throughout the developed portions of the SMC Facility. These areas do not provide suitable habitat for ecological receptors. The various habitats are described in more detail below.

2.1.1 Aquatic Habitats

Aquatic habitats are associated with the Hudson Branch, a small perennial stream that is located along the southern boundary of the SMC Facility (see Figure 2-1). The Hudson Branch generally flows to the southwest for approximately 1.3 miles, where it flows into Burnt Mill Pond. Burnt Mill Pond has a surface area of approximately 15 acres in size and is impounded by a dam. Burnt Mill Pond is reported to be shallow, with a mean depth of 2.4 feet. Burnt Mill Pond was recently dredged in 2006. Extensive flooding in 2011 resulted in significant damage to the Burnt Mill Pond dam. Currently, surface waters within the pond are only present within the former Hudson Branch and Burnt Mill Branch channels until repairs to the dam are completed.

Burnt Mill Branch (sometimes referred to as the Manaway Branch) generally runs north to south and discharges into Burnt Mill Pond. Burnt Mill Branch is located approximately 4,000 feet west of the Site. The headwaters of Burnt Mill Branch begin approximately 7,000 feet northwest of the Site. The Burnt Mill Branch continues from Burnt Mill Pond, joining the Maurice River approximately 9,000 feet southwest of Burnt Mill Pond. The Burnt Mill Branch was selected as an aquatic habitat reference area for the Hudson Branch since it is similar to the Hudson Branch and the upper portion of this stream (i.e., above Burnt Mill Pond) is outside the Site's influence and not in proximity to obvious sources of contamination.

The Hudson Branch is fairly typical of a low gradient stream in that riffle-run habitats are not present and the stream substrate consists of fine particle-sized material (i.e., fine sands, silt, and clay) with considerable organic matter present. Total organic carbon contents in sediment samples have ranged from 1.2 percent to 64.8 percent. The pH of the Hudson Branch sediments is generally neutral. Three ponded areas of the Hudson Branch have been identified (Figure 2-2). One broad area of ponded water and wetlands vegetation, approximately 1.4 acres in size, is present on SMC property within the headwaters of the Hudson Branch (hereafter referred to as the ponded area), while a small impoundment (approximately 0.3 acres) is present approximately 3,000 feet downstream of the SMC Facility (Figure 2-2). This smaller pond is located in a residential area. In addition, an on-site impoundment which receives stormwater and treated ground water that is discharged from SMC Outfall DSN-004A is present on SMC property (identified as "Pond" on Figure 2-2 and "Drainage Basin on Figure 2-3). The on-site impoundment, as referenced in the current New Jersey Pollutant Discharge Elimination System (NJPDES) permit, receives a combination of facility stormwater and treated water from the on-site groundwater treatment system. The water from the on-site impoundment is directed into a ditch or unnamed tributary of the Hudson Branch. The on-site impoundment was installed in the early 2000s.

The upstream portion of the Hudson Branch above the ponded area consists of a shallow gully that contains surface water flows only on an intermittent basis. The ponded area is approximately two to six feet in depth. The substrate is soft with a variable total organic carbon content that ranges from 6.6 percent to 19 percent. Vegetation consists primarily of common reed (*Phragmites australis*) and water willow (*Decodon verticillatus*). Water flows from the ponded area through a culvert (under the former Haul Road) to form the Hudson Branch.

The portion of the Hudson Branch located immediately downgradient of the ponded area is a poorly defined channel. Surface water flows generally meander through a broad area of common reed for approximately 750 feet before the Hudson Branch becomes a more defined channel. Based on aerial photographs (ENSR, 1989), the portion of the Hudson Branch immediately downgradient of the ponded area appears to have been channelized within a straight ditch through former cultivated fields. This alteration occurred between 1940 and 1951, and this portion of the Hudson Branch remained channelized until sometime around 1974 to 1977, when the stream appeared to follow a more meandering route. Water depths within the identified stream channel portions of the Hudson Branch (generally present throughout the Hudson Branch downgradient of the area of common reed discussed above) range from several inches to approximately three feet within pooled areas of the stream. Low flow velocities are present throughout the entire reach of the Hudson Branch.

2.1.2 Terrestrial Habitats

The Revised SLERA evaluated four terrestrial habitats associated with the Site. These areas included the Former Production Area, Former Lagoons Area, Eastern Storage Areas, and Southern Area. A plan depicting the boundaries of these areas and the physical features of the facility areas is provided as Figure 2-3. In addition, wetlands located within the southern portion of the Site and downgradient of the Site that are associated with the Hudson Branch also represents a key terrestrial habitat that was evaluated in the Revised SLERA.

The Former Production Area is located in the northwest part of the SMC Facility and is the area where the majority of former manufacturing activities occurred. The Former Production Area is approximately 22 acres, and is largely covered with buildings and asphalt or concrete pavement. Due to the extremely disturbed and developed nature of the Former Production Area, habitat for ecological receptors is very limited. Therefore, complete exposure pathways to ecological receptors are not present and this area.

The Former Lagoons Area is located in the central portion of the SMC Facility and occupies approximately 4.5 acres. The Former Lagoons Area includes closed lagoons that were used from the 1960s to the 1990s for wastewater treatment. The lagoons were characterized, remediated, and closed from 1992 to 1997. Closure activities included sludge removal, liner removal, contaminated soil removal, post-excavation sampling, and backfilling. Currently, the Former Lagoons Area is covered by light vegetation, which includes small trees and grass. The Revised SLERA concluded that concentrations of contaminants in surface soil within the Former Lagoons Area do not present a potential ecological risk.

The Eastern Storage Areas, which consist of two separate areas, are located to the east of the Former Production Area and Former Lagoons Area. These areas were previously used as the By-Product Drum Storage Area and a bone yard. These areas have never included buildings or offices. Currently, the areas are covered with gravel, light vegetation and piles of concrete debris. The Revised SLERA concluded that these areas may present a potential risk to terrestrial plants and insectivorous wildlife species.

The Southern Area is located along the southern property line of the SMC Facility. The Southern Area includes undeveloped areas as well as the on-site impoundment and the Former Thermal Pond Area. The Former Thermal Pond Area covers approximately 0.77 acres and consists of a rectangular depression area of approximately 3 feet deep. The Former Thermal Pond Area was used on a few occasions as an emergency holding reservoir for treated wastewater. The Former Thermal Pond Area is currently covered with vegetation (herbaceous vegetation and shrubs primarily). Based on historical aerial photographs, some areas in the Southern Area were used for miscellaneous storage. Currently, the Southern Area is covered with vegetation that includes grass and small trees. The Revised SLERA concluded that terrestrial vegetation may be potentially at risk from detected concentrations of contaminants in surface soil samples collected from this area.

Multiple wetland habitats are present adjacent to the Hudson Branch including the following palustrine wetland types: emergent marsh, broad-leaved deciduous forest, scrub-shrub, and open water. The width of the wetlands ranges from approximately 5 feet (along the generally dry portion of Hudson Branch along the SMC Facility boundary) to over 400 feet (near the southwest corner of the Site). A wetland cover survey was conducted in 1996 by TRC and included the identification and subsequent field survey of the stream center line (thalweg) and limits of each wetland cover type (including the upland/wetland boundary) at 250-foot intervals along the Hudson Branch (TRC, 1996a). The extent of the wetlands and associated habitat types are indicated in Figure 2-2.

Above the unnamed pond, narrow bands of palustrine scrub-shrub and emergent marsh wetlands are located adjacent to the intermittent surface flow areas of the Hudson Branch. Plants noted within these areas include common reed, highbush blueberry (*Vaccinium corymbosum*), and willow (*Salix sp.*). A broad band of wetlands is present at the confluence of the Hudson Branch with the unnamed pond. Although the northern shore of the pond is bordered by a steep bank, the eastern and southern shorelines contain a wide band of emergent herbaceous marsh vegetation (primarily common reed) with a forested overstory consisting of young red maple (*Acer rubrum*).

Downgradient of the unnamed pond, the wetland vegetation consists primarily of common reed immediately adjacent to the Hudson Branch. Wide bands of forested wetlands consisting of red maple and tupelo (*Nyssa sylvatica*) in the overstory are present to the north and south upgradient of the areas of common reed. These forested areas contain a well-stocked and dense stand of intermediate-sized trees with a dense understory of sweet pepperbush, highbush blueberry, laurel, green-brier, and cinnamon fern (*Osmunda cinamomea*). A sparse forest overstory of red maple is present within the area located between the divided portions of the Hudson Branch (upgradient of West Boulevard).

The broad area of wetlands located between West Boulevard and Weymouth Road consists of a sparse forest overstory (comprised of large mature trees) with a herbaceous understory comprised of various grasses, sedges, and rushes. South of Weymouth Road, the wetlands bordering the Hudson Branch remain fairly extensive with little topographical relief present. This area of wetlands is a well-interspersed area of scrub-shrub and emergent herbaceous wetlands containing common elder (*Sambucus canadensis*), multiflora rose (*Rosa multiflora*), and arrow-wood (*Viburnum recognitum*) in the shrub layer, with various grasses, cat-tail (*Typha latifolia*), water willow, and sensitive fern (*Onoclea sensibilis*) also present. This wetland gradually grades into a palustrine emergent marsh consisting of water willow, pickerel weed (*Pontederia cordata*), and other herbaceous vegetation. A broad area of mature red maple forested wetlands is present downgradient of this marsh. This forested wetland extends to West Arbor Avenue. In addition to the vegetation described above, stands dominated by common reed are also present within portions of the wetland located between Weymouth Road and West Arbor Avenue. South of West Arbor Avenue is a disturbed area that presently contains a small man-made pond that was formed by impounding the Hudson Branch. This disturbed area extends for several hundred feet (to Northern West Avenue) where mature red maple forested and scrub-shrub wetlands are present until the Hudson Branch reaches Burnt Mill Pond.

2.1.3 Potential Receptors

Ecological data collected during various investigations conducted at the site and along the Hudson Branch as well as a review of the available literature are used to identify potential receptor species (i.e., amphibians, birds, mammals, and reptiles). Plant species provide an important component of the habitats identified on the Site (and adjacent to the Hudson Branch) and have been briefly discussed above. A variety of wildlife receptors have either been observed at the Site or are expected to inhabit the habitats identified on or adjacent to the Site. The primary ecological receptors of concern for the adjacent aquatic habitats are organisms such as macroinvertebrates which inhabit the Hudson Branch and those wildlife species that forage on these receptors. Insectivorous birds and mammals are of particular concern as they are representative of higher trophic level receptors, which are more susceptible to contaminants that bioaccumulate within the tissues of their prey.

Although fish may be present within limited portions of the Hudson Branch (e.g., ponded areas which comprise only a small portion of the aquatic habitat provided by the Hudson Branch), fish populations are unlikely to be significant to support piscivorous receptors. The small size of the stream and shallow depths present throughout most of its length preclude the presence of significant fish populations that would provide a forage base for piscivorous wildlife. Fish are likely to be present in substantial numbers within the ponded portions of the Hudson Branch which only include Burnt Mill Pond and a very small pond formed by impounding the Hudson Branch at a location south of West Arbor Avenue and east of North West Avenue. This very small pond is insufficient for supporting piscivorous receptors. Burnt Mill Pond, which is located at the junction of the Hudson Branch and Burnt Mill Branch, likely supported a substantial fishery that may be utilized by piscivorous wildlife. However, Burnt Mill Pond is located at the terminus of the Hudson Branch which contains decreasing contaminant concentrations from its origin at the SMC Facility. In addition, Burnt Mill Pond was dredged in 2006 while extensive flooding in 2011 resulted in significant damage to the Burnt Mill Pond dam. Burnt Mill Pond was drained by the Town of Vineland during the preparation of the BERA due to potential dam failure. The water flows within Burnt Mill Pond (at the time of the BERA submission) were restricted to shallow channels from the Hudson Branch and Burnt Mill Branch.

These channels currently are unlikely to provide significant fishery habitat that would support piscivorous wildlife receptors.

Terrestrial receptors such as herbivorous/insectivorous/carnivorous birds and mammals may also be at risk due to potential ingestion of contaminated plants and invertebrates that have bioaccumulated elevated levels of contaminants within their tissues from impacted surface soils. Wildlife species that may potentially inhabit the forested wetlands/uplands and the Hudson Branch are discussed in greater detail in the Revised SLERA.

The New Jersey Natural Heritage Program was recently contacted regarding the presence of endangered, threatened, or rare species on or near the Site. Based on the request, the Natural Heritage Database and the Landscape Project habitat mapping were searched for occurrences of any rare wildlife specifies, plant species, wildlife habitat or natural communities on the Site. The Natural Heritage Program identified the great blue heron (*Ardea herodias*) as potentially occurring within the Site. The New Jersey status for the great blue heron is S3B/S4N indicating that the breeding population is listed as Special Concern while the non-breeding (i.e., wintering) population is stable. In addition, the wood thrush (*Hylocichla mustelina*), also listed as S3B (state species of Special Concern), potentially occurs within on the Site based on landscape habitat characteristics. Finally, the coastal bog metarranthis (*Metarranthis pilosaria*), a state-ranked rare S3 moth may potentially be present in the vicinity of the Site. No records of any additional rare wildlife species, wildlife habitat, rare plants or natural communities were identified (see Appendix C).

The great blue heron forages within aquatic habitats on various prey including fishes and macroinvertebrates. It is a colonial nesting species with nests typically located in trees (often dead trees) within wetlands or ponds. This species may be expected to forage within the Hudson Branch, particularly within the ponded areas or broad shallow marsh areas present within this stream. The wood thrush is primarily an insectivorous bird (although some fruit is also taken) that generally inhabits large, contiguous areas of forested uplands/wetlands. Preferred wood thrush breeding habitat consists of deciduous or mixed deciduous/conifer woodlands containing a dense understory, particularly within or near wetlands. Coastal bog metarranthis habitat includes pitch pine/oak barrens and acidic swamps and bogs.

2.2 Site Contaminants

For the characterization of ecological risk, the primary media of concern at the Site are surface water and sediment associated with the aquatic habitats of the Hudson Branch and surface soils within the forested and grassland habitats associated with or adjacent to the facility (i.e., the eastern storage areas and the Hudson Branch wetland).

2.2.1 Data Management

Analytical data used in the BERA include all recent (i.e., 2009 or later) surface water and sediment sampling results and all surface soil sampling results. Analytical results for each sample are presented in Appendix A. The analytical data were statistically summarized by environmental medium (Appendix B). The locations of all surface water, sediment, and surface soil samples used in the BERA are depicted in Figures 2-4 through 2-7.

The following discussion provides an overview of the recent site characterization and BERA field investigations conducted at the facility since the Revised SLERA was submitted. For additional information on earlier sampling, the reader is directed to TRC (1992, 1996a, 2011). Data obtained as part of the recent site characterization were evaluated for their usability by TRC according to USEPA's procedures and guidelines.

Surface Water

Surface water samples were collected downstream of the Site in October 2011 to determine the presence, nature, and extent of surface water contamination. A total of seven surface water samples were collected from locations along the Hudson Branch from the unnamed pond down to Burnt Mill Pond while four samples were collected within Burnt Mill Pond and two samples were collected from Burnt Mill Branch downstream of Burnt Mill Pond (see Figure 2-4). An additional eight surface water samples were collected from the portion of Burnt Mill Branch located upstream of Burnt Mill Pond and represent reference area (i.e., background) surface water samples. All samples were analyzed for target analyte list (TAL) inorganic compounds (both total recoverable and dissolved concentrations) and water hardness. Surface water samples represent total recoverable (i.e., non-filtered) metal concentrations. Each of the Hudson Branch and reference area samples were also analyzed for total compound list (TCL) volatile organic compounds (VOCs). Results for each surface water sample used in the BERA are presented in Tables A-1 and A-2 of Appendix A while summary statistics are provided in Tables B-1 and B-2 of Appendix B.

Sediment

During 2009 and 2011, sediment samples were collected within the Hudson Branch (including Burnt Mill Pond) to determine the presence, nature, and extent of sediment contamination as well as the reference area (Burnt Mill Branch). Stream sediment sampling locations are shown on Figure 2-5.

In March 2009, 10 sediment samples were collected from previous sampling locations within the Hudson Branch (SD-4, SD-9A, SD-12, SD-15, SD-17, SD-18, SD-19, SD-20, SD-23, and SD-25) to determine concentrations of 10 metals (TRC, 2009). Two reference samples (SD-30 and SD-35) were also collected from the Burnt Mill Branch at this time. All samples were collected from 0 to 6 inches and were analyzed for arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, total organic carbon (TOC), pH, and grain size.

Additional sediment samples were recently collected in October 2011 from seven transects along the Hudson Branch (total of 11 samples) and six samples from the on-site impoundment while eight sediment samples were collected from Burnt Mill Branch above Burnt Mill Pond as a reference area. Each sample was collected from 0 to 6 inches and analyzed for TCL semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyl (PCB) Aroclors, TAL metals, TOC, pH, and grain size. Four additional samples were collected in October 2011 from Burnt Mill Pond and two sediment samples were collected from the Burnt Mill Branch (below Burnt Mill Pond) from 0 to 6 inches and analyzed for TAL metals, TOC, pH and grain size. Six additional sediment samples were collected from locations within the Hudson Branch where aquatic vegetation and invertebrate samples were also sampled. These sediment samples were collected from 0 to 6 inches in depth and analyzed for antimony, barium, beryllium, chromium, copper, lead, mercury, nickel, vanadium and zinc.

All sediment chemistry results from the samples discussed above are presented in Tables A-3 and A-4 of Appendix A and were evaluated in the BERA. Summary statistics of the Hudson Branch and reference samples (Burnt Mill Branch) are presented in Tables B-3 and B-4, respectively, of Appendix B.

Surface Soil

A total of 118 surface soil samples collected within or downgradient of the facility from October 1990 through October 2011 were considered relevant to the areas of interest for terrestrial upland/wetland receptors (i.e., within areas providing habitat) and therefore were included in the BERA. Seventy-five (75) of these samples were collected from a depth of 0 to 6 inches while 15 samples were collected from a depth of 0 to 12 inches. The remaining 28 surface soil samples were collected from the top two feet using a split-spoon sampler during the soil boring program.

In October 1990, 52 surface soil samples were collected from a depth of 0 to 6 inches within the terrestrial/wetland areas providing habitat for ecological receptors (TRC, 1992). Two (2) samples were collected from the former lagoons area, 16 samples from the eastern storage areas, 20 samples from the southern area of the facility, and 14 samples from the wetland associated with the Hudson Branch. These later samples were taken adjacent to the SMC facility. Each of these samples was analyzed for TAL inorganic compounds as well as hexavalent chromium, boron, niobium, strontium and titanium. One surface soil sample collected from the eastern storage areas was also analyzed for TCL VOCs and SVOCs along with pesticides, PCB Aroclors and zirconium.

In November 1990, 24 soil borings from a depth of 0 to 2 feet were collected from the former lagoons area (7 samples), eastern storage area (8 samples) and the southern area (9 samples) (TRC, 1992). Each of these soil samples was analyzed for TAL inorganic compounds and hexavalent chromium. Six samples were also analyzed for the inorganics boron, niobium, strontium and titanium with one of these samples also analyzed for zirconium. Three soil samples collected within the eastern storage areas (SB20-01, SB32-01 and SB33-01) were also analyzed for PCB Aroclors.

In a supplemental sampling investigation performed in August 1995, surface soil samples (0 to 12 inches) were collected in areas of the Site in order to delineate the horizontal extent of contamination detected (TRC, 1996a). For the purpose of the BERA, only 15 surface soil samples (SS-13, SS-14 and SS-16 through SS-28) collected in August 1995 are considered relevant and a brief description of the sampling locations is provided below. These sampling locations are also depicted in Figures 2-6 or 2-7.

Seven surface soil samples (SS-16 through SS-21, SS-23, SS-24, and SS-28) were collected in August 1995 within the wetland associated with the Hudson Branch. These samples were collected to further define the extent of inorganic compounds detected. Each of the surface soil samples was analyzed for TAL inorganic compounds and hexavalent chromium.

Four surface soil samples were collected off-site and to the south of the property line, in the vicinity of sample locations RA-5, RA-13, and RA-14. Supplemental surface soil samples SS-25, SS-26 and SS-27 were analyzed for beryllium, while sample SS-22 was analyzed for TAL inorganic compounds and hexavalent chromium. Surface soil samples SS-13 and SS-14 were collected from the eastern storage areas and analyzed for PCB Aroclors.

Several soil borings were also collected from 0 to 2 feet within the eastern storage area and the southern area of the SMC facility during August 1995. Three samples were collected from the eastern storage areas and analyzed for pesticides and PCB Aroclors while one additional sample was collected from the southern area and analyzed for hexavalent chromium.

In April 1996, 17 additional surface soil samples were collected at 8 transects (SD-100 through SD-107) within the wetlands associated with the Hudson Branch in order to determine the lateral extent of metal contamination within downstream areas of this wetland (as well as within the sediments of the Hudson Branch) (TRC, 1996b). The locations of these samples are presented on Figure 2-6. Each of these samples was collected from 0 to 6 inches and analyzed for chromium, copper, nickel and vanadium. Cyanide was also analyzed in 11 of these samples.

TRC collected additional surface soil samples in October 2011 and January 2012 within the eastern storage areas and/or the Hudson Branch wetlands. Six surface soil samples were collected from the eastern storage areas in October 2011 concurrently with terrestrial invertebrates and analyzed for chromium and vanadium. A total of 30 samples were collected from the Hudson Branch wetlands in 2011/2012. Eight of these samples were analyzed for chromium and vanadium while the remaining samples were analyzed for TCL SVOCs, pesticides/PCBs and TAL metals as well as soil pH.

The location of all surface soil sampling locations within the eastern storage areas and the Hudson Branch wetland are depicted on Figures 2-6 and 2-7, respectively. These two areas represent the primary terrestrial areas of concern (as identified in the Revised SLERA) for this BERA.

2.2.2 Data Evaluation

Data were qualified by the analytical laboratory and evaluated for their usability as described previously. The qualification and evaluation of the analytical data included a comparison of the site data to corresponding blank (laboratory, field, equipment, and trip) concentration data. Data rejected by the usability evaluation ("R" qualified) were not used. Estimated values (e.g., "J" qualified) were used in the BERA without modification. Prior to using analytical data for a primary sample with an associated field duplicate, the analytical values for the primary sample and the field duplicate were averaged together to provide a single set of values for the field duplicate pair. The following conventions were used for field duplicate samples:

- If both samples have detected values (flagged with "J" or unflagged), the average of the values was used. If one value or both values are flagged with "J", prior to averaging, the resulting averaged value was flagged with "J" as appropriate.

- If both samples have nondetected values (flagged with "U" or "UJ"), the lower value and its flag were used.

- If one sample has a nondetect value (flagged with "U" or "UJ") and the other sample has a detected value (flagged with "J" or unflagged) the following is done:

    - If the detected value is less than or equal to the nondetected value, the detected value and its flag were used; or
    - If the detected value is greater than the nondetected value, the average of detected value and the nondetected value were used. The resulting averaged value was flagged with "J".

- If one sample has a nonrejected value (flagged with "J", "U", "UJ", or unflagged) and one sample has a rejected value (flagged with "R"), the nonrejected value and its flag were used.

The range of detection limits was determined based on the individual sample-specific detection limit (or sample quantitation limit) for each analyte. Because of sample dilution and/or sample weights, laboratory detection limits for individual samples can be higher than the method-specified detection limits. Minimum and maximum sample quantitation limits (SQLs) were determined for each non-detect analyte using the sample's SQL. A number of samples where a constituent was not detected did not have associated detection limits or SQLs reported. These samples were not used in determining the mean or upper confidence of the mean concentrations.

The frequency of detection is the number of samples with detected values per the number of samples analyzed. The number of samples with detected values was determined by totaling all samples with detected values. The number of samples analyzed was determined by totaling all samples with detected or nondetected values (flagged with "U", "UJ", "J" or unflagged). Rejected values (flagged with "R") were not included in the total number of samples analyzed. For field duplicate samples, only one value was used when determining the number of samples analyzed and the number of detected values (as determined using the procedure described above).

2.2.3 COPEC Selection

Surface water and sediment sampling results collected during recent field investigations on and/or in the vicinity of the Site were compared with applicable ecological screening benchmarks that are available for each medium. A comparison of the maximum concentrations of surface water and sediment constituents detected in the more recent available data with applicable screening benchmarks was conducted in order to re-select COPECs for the BERA. The maximum concentration of each surface water and sediment constituent detected was compared with its appropriate ecological screening value. If the analyte's detected concentration at any surface water or sediment sample exceeds its respective screening value, the constituent was retained as a COPEC.

The surface soil sampling results collected during previous field investigations on and/or in the vicinity of the Site were previously compared in the Revised SLERA with applicable ecological screening soil benchmarks in order select PCOPECs. The maximum concentration of each surface soil constituent detected was compared with its appropriate ecological screening value. If the analyte's detected concentration at any surface soil sample exceeded its respective screening value, the constituent was retained as a PCOPEC. In addition, constituents were retained as surface soil PCOPECs if a screening value was unavailable for that analyte. The Revised SLERA then evaluated these PCOPECs by modeling exposure to various ecological receptors and comparing the estimated exposure doses to appropriate toxicity reference values. Those PCOPECs identified as providing a risk to ecological receptors (i.e., chromium, manganese and vanadium) were retained as COPECs. The more recent surface soil data collected in 2011 and 2012 primarily focused on the COPECs identified in the Revised SLERA. Therefore, COPECs were not re-selected for this BERA and the COPECs identified for surface soils in the Revised SLERA are evaluated in this BERA.

A summary of the sampling results that present detection frequency, minimum and maximum detected concentrations, minimum and maximum SQLs, arithmetic mean, and Upper Confidence Level (UCL) of the mean is presented in Appendix B for each medium. A brief synopsis of the COPECs retained for the surface water, sediment and surface soil media are provided below.

<u>Surface Water</u>

A total of 7 surface water samples were collected from the Hudson Branch adjacent to or downstream of the Site and analyzed for TCL VOCs while 13 samples were collected and analyzed for total recoverable and dissolved metal concentrations. A total of 1 VOC (cis-1,2-dichloroethene) and 14 inorganics were detected in one or more of the surface water samples. Screening benchmarks for these surface water samples were (in decreasing order of preference):

- New Jersey DEP Ecological Screening Criteria for Surface Water (Freshwater aquatic – chronic) (NJDEP, 2009);
- National Recommended Water Quality Criteria (Freshwater – chronic) (USEPA, 2009); and,
- EPA Region III BTAG Freshwater Screening Benchmarks (USEPA, 2006).

For metals with hardness-dependent screening benchmarks, the average detected water hardness value (47.2 mg/L) within the Hudson Branch samples was used to calculate the benchmark.

The maximum concentrations detected in the surface water samples were compared to their applicable ecological screening benchmarks (Table 2-1). The maximum concentrations of six inorganics (aluminum, chromium, copper, iron, manganese, and vanadium) exceed their respective total and/or dissolved screening benchmarks and were retained as surface water COPECs. The remaining eight detected inorganics (calcium, cobalt, lead, magnesium, nickel, potassium, sodium and zinc) and cis-1,2-dichloroethene have maximum concentrations less than their respective screening benchmarks. Therefore, these constituents were not retained as surface water COPECs.

In general, the COPECs identified using the recent 2011 data are similar to the COPECs identified in the Revised SLERA using the outdated 1995 sampling results. The only differences are that nickel and zinc were previously retained as COPECs since these metals were detected above their screening benchmarks in 1995. However, concentrations of nickel and zinc detected in 2011 did not exceed their screening benchmarks.

Sediment

A total of up to 39 sediment samples were recently collected from the Hudson Branch either adjacent to or downstream of the facility during 2009 to 2011. A total of 20 SVOCs (including 16 Polycyclic Aromatic Hydrocarbons (PAHs) and 3 phthalates), 6 pesticides (4,4-DDT and its derivatives 4,4-DDD and 4,4-DDE, alpha and gamma chlordane, and dieldrin), 3 PCB Aroclors, and 21 inorganics were detected in one or more of the sediment samples. Screening benchmarks for these sediment samples were (in decreasing order of preference):

- New Jersey DEP Ecological Screening Criteria for Sediment (Freshwater Lowest Effect Level) (NJDEP, 2009);
- EPA Region III BTAG Freshwater Sediment Screening Benchmarks (USEPA, 2006); and,
- EPA Region 5 Sediment Ecological Screening Values (USEPA, 2003a).

Sampling results were compared to their applicable ecological screening benchmarks (Table 2-2). The maximum concentrations of 15 SVOCs (bis(2-ethylhexyl)phthalate and 14 PAHs) exceed their respective sediment screening benchmarks and were retained as COPECs. Carbazole and dimethyl phthalate were also retained as COPECs since sediment screening benchmarks for these SVOCs are unavailable. The remaining three SVOCs were detected at low concentrations below their screening values and were eliminated from further evaluation in the BERA. Four detected pesticides (dieldrin, 4,4-DDT and its derivatives) and the three detected PCB Aroclors exceed their sediment benchmarks and were retained as COPECs. Each of these contaminants is also a bioaccumulative compound of concern (USEPA, 2000).

All of the inorganics detected in the Hudson Branch except for cobalt, manganese and selenium were retained as sediment COPECs. The maximum concentrations of aluminum, antimony, arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, silver and zinc exceed their respective screening benchmark. Barium, beryllium, calcium, magnesium, potassium, and vanadium were also retained as sediment COPECs since screening benchmarks are unavailable. Sediment COPECs listed as a bioaccumulative concern are also indicated in Table 2-2.

Sediment COPECs identified in this BERA using more recent 2009 and 2011 data that were not previously identified as COPECs in the Revised SLERA primarily include PAHs. The concentrations of most constituents detected in 2009/2011 generally decreased from levels noted in the earlier sediment samples collected in 1990 and 1995.

Surface Soil

A total of 100 surface soil samples were collected from the eastern storage areas and Hudson Branch wetlands. Constituents detected in the surface soil samples were primarily limited to inorganics as metals represent the main contaminants associated with the Site. A total of 29 inorganics were detected in surface soil samples collected from the eastern storage areas while 25 inorganics were detected in surface soil samples collected at the Hudson Branch wetlands. Two SVOCs (bis(2-ethylhexyl)phthalate and di-n-butyl phthalate) and three PCB Aroclors (1248, 1254 and 1260) were detected in 30 soil samples collected from the eastern storage areas while 17 SVOCs (includes 13 PAHs and 2 phthalates), three PCB Aroclors (1248, 1254 and 1260), and six pesticides were noted in the 70 Hudson Branch wetland soil samples.

A comparison of the maximum detected concentrations for each constituent with their respective surface soil screening benchmarks was presented in the Revised SLERA for each of the areas of concern (i.e., former lagoons area, eastern storage areas, southern area and Hudson Branch wetlands). Screening benchmarks for the surface soil sampling results were (in decreasing order of preference):

- USEPA Ecological Soil Screening Levels (eco-SSLs). The lowest reported concentration for plants, invertebrates, birds and mammals was selected. (USEPA, 2003; USEPA, 2005; USEPA, 2006; USEPA, 2007; USEPA, 2008);

- New Jersey DEP Ecological Screening Criteria for Soil. The lowest reported concentration for wildlife PRGs (flora and fauna) and terrestrial plants was selected. (NJDEP, 2009);

- EPA Region 5 RCRA Ecological Screening Levels for Soil (USEPA, 2003a); and,

- Toxicological Benchmarks for Effects on Terrestrial Plants or Soil Invertebrates. The lowest reported concentration was selected (Efroymson et al., 1997a; Efroymson et al., 1997b).

Inorganics and PCB Aroclors 1248 and 1254 were detected at concentrations above their screening benchmarks and were retained as PCOPECs for terrestrial/wetland habitats present at the facility.

PCOPECs retained for each of the four areas evaluated in the Revised SLERA were assessed for their potential to present risk to various ecological receptors. The surface soil concentrations of chromium and vanadium may present a risk to avian and mammalian insectivores (represented by the American robin and short-tailed shrew) that forage at the eastern storage areas. Therefore, chromium and vanadium were retained as COPECs for the eastern storage area and were evaluated further in this BERA. Surface soil concentrations of chromium may pose a risk to foraging avian and mammalian insectivores at the Hudson Branch wetland while detected concentrations of vanadium provide a potential risk to foraging avian insectivores. These PCOPECs were retained as surface soil COPECs for the Hudson Branch wetland and are further evaluated in this BERA. In addition, surface soil concentrations of manganese, nickel, and/or vanadium were identified as COPECs for the terrestrial plant communities within the eastern storage area, southern area and Hudson Branch wetland.

At the time of the Revised SLERA preparation, the average soil pH of the surface soil samples within the Site was unknown as little to no pH soil sampling results were available. Aluminum may potentially be bioavailable and a contaminant of concern if soil pH is less than 5.5 (USEPA, 2003b) while iron is generally unavailable with a soil pH greater than 5.0 and less than 8.0 (USEPA, 2003c). The surface soil samples collected from the Hudson Branch wetland in 2011 and 2012 result in an average soil pH of 5.8 which would indicate that aluminum and iron would not represent COPECs for the surface soil at the Site.

2.3 Contaminant Fate and Transport

Specialty glass manufacturing began at the Site in 1924. SMC purchased the Site in the early 1950s and, from 1955 to approximately 2007, SMC manufactured specialty steel and super alloy additives, primary aluminum master alloys, metal carbides, powdered metals and optical surfacing products at the Site. Some of the metals contained in raw materials used at the facility are: aluminum, barium, bismuth, calcium, chromium, copper, iron, lead, magnesium, manganese, nickel, oxides of niobium, silicon, titanium, vanadium, and zirconium. In the past, oxides of chromium were used at the facility. The Site is currently used as office space and is sublet as warehousing and construction equipment storage space.

Within the SMC Facility, drainage from developed portions of the Facility is managed via a storm drain system and through overland flow. Most of the drainage from the developed portion of the SMC Facility is directed to the on-site impoundment located in the southwestern portion of the Facility. The drainage from the west portion of the Site) is discharged into a ditch near the western boundary of the Facility. Stormwater drainage in the eastern undeveloped area of the Site is generally via sheet flow. In the restricted area, the surface runoff is controlled with berms located to the south and inside the fence.

Historically, the Site had three permitted discharge water outfalls to the Hudson Branch. Following the closure of on-site lagoon features, the outfalls were revised to reflect current discharge conditions at the Site. Currently, there are two permitted outfalls (DSN004A and DSN001B).

DSN004A is located at the southwest corner of the on-site impoundment in the southwest portion of the SMC Facility. DSN004A receives a combination of facility stormwater and treated water from the on-site groundwater treatment system. When on-site operations were more extensive, non-contact cooling water was also discharged at this location. Flows from DSN004A are recorded at an H-flume located at the outfall.

DSN001B is located at the northwest corner of the on-site impoundment, and is the “tailpipe” of the pump and treat system. The treated groundwater pump and treat system discharge is monitored separately from the discharge at an internal monitoring point for the treatment system referred to within the NJPDES permit as DSN001B.

The fate and transport of COPECs identified at the Site are dependent, in part, upon their physical and chemical properties. Some of these properties important to their fate and transport are solubility, volatility, partition coefficient, biodegradation, and oxidation/reduction.

Potential contaminant release mechanisms at this Site include historic releases of COPECs from the SMC Facility via contaminated ground water and/or stormwater runoff resulting in the deposition of site-related constituents in the adjacent Hudson Branch. These constituents may either seep into the surface waters of the Hudson Branch or be associated with the sediments (bound to organic or fine particulate matter) of the Hudson Branch. Potential transport mechanisms include the following:

- erosion and transport of contaminant-carrying surface soil by wind, rain, flooding, and melting snow; and,

- leaching of contaminants from contaminated soils and sediments to surface water and ground water.

The primary COPECs detected in soils at the Site (metals) have low solubility and low potential to leach into ground water. In general, due to the high partition coefficients of the COPECs present at the Site, overland transport via surface water runoff from impacted surface soils and the subsequent sedimentation of particles that contain sorbed COPECs into nearby aquatic areas such as the Hudson Branch is expected to represent the primary transport mechanism at the Site. An additional transport mechanism from the Site surface soils would be associated with wind blown particles that are deposited within nearby terrestrial and/or aquatic habitats.

2.4 ECOTOXICITY LITERATURE REVIEW

The COPECs identified in the Revised SLERA (TRC, 2011) as posing a risk concern at the Site primarily include chromium and vanadium although other metals including antimony, barium, copper, and mercury may also present a risk to wildlife receptor species. Other COPECs identified for the surface water and sediment media include PAHs, phthalates, PCB Aroclors and several additional inorganics. A review of the literature on the toxicity of these COPECs was previously provided in the Revised SLERA.

A discussion of the toxicity of the primary COPECs (i.e., chromium and vanadium) to ecological receptors is provided below. For the BERA, both chronic no-observable-adverse-effect-levels (NOAELs) and chronic lowest-observable-adverse-effect-levels (LOAELs) were used as estimates of ecotoxicity. Because toxicity data for the selected receptor species are generally unavailable, it is necessary to extrapolate toxicity data from other species, usually laboratory test animals. However, the test endpoints for the laboratory species must be significant to the measurement receptor species under field conditions. Endpoints that were considered significant for this risk assessment included adverse effects on growth, reproduction, and survival that are most likely to result in adverse effects to wild populations of receptors.

The chronic NOAELs and LOAELs for avian and mammalian species were used for assessing the effects of exposure by the measurement receptor species. An ecotoxicity literature review has been performed for the primary COPECs and is discussed in the following subsections.

2.4.1 Chromium

Chromium has not been observed to biomagnify and concentrations are usually highest at lower trophic levels (Eisler, 1986). Chromium (trivalent and total) is not considered to be a bioaccumulative compound of concern (USEPA, 2000). The toxicity of chromium varies widely between organisms and is dependent on form. Adverse effects of chromium to sensitive freshwater species have been documented at 10 µg/L of hexavalent chromium and 30 µg/L of trivalent chromium (Eisler, 1986). Exposure to hexavalent chromium has been demonstrated to reduce growth rates in both freshwater algae and duckweed, and to affect the survival and fecundity of cladocerans (Eisler, 1986).

For wildlife, adverse effects have been reported for trivalent chromium at 5.1 mg/kg in avian diets and 10.0 mg of hexavalent chromium per kilogram in mammalian diets (Eisler, 1986).

USEPA (2008) presents the results of toxicity studies conducted on avian and mammalian test species regarding biochemical, behavior, pathology, physiology, growth, reproduction and survival effects for various doses of chromium (both hexavalent and trivalent chromium for mammals and trivalent chromium for birds). For avian species, the geomean of growth and reproduction no observable adverse effect level (NOAEL) results was calculated to be 2.66 mg/kg-body weight/day based on 12 results while the geomean for lowest observable adverse effect level (LOAEL) effects on avian growth and reproduction was 15.6 mg/kg-BW/day (based on four studies).

Most of the avian studies were conducted on the domestic chicken (*Gallus domesticus*) and only 2 of the 14 studies presented both NOAEL and LOAEL results. One of these studies was conducted with black ducks (*Anas rubripes*) and reported reduced reproductive success after ingesting trivalent chromium for six to nine months. The NOAEL and LOAEL from this study (Haseltine et al., unpublished in USEPA, 2008) were reported at 0.57 and 2.78 mg/kg-BW/day, respectively. The other study (Meluzzi et al., 1996 in USEPA, 2008) reporting both NOAEL and LOAEL results for reduced albumin weights in chickens that ingested trivalent chromium for 15 days. The NOAEL and LOAEL results from this study were 37.7 and 75.4 mg/kg-BW/day, respectively. The evaluation score for this study (81) was the highest of the 14 studies investigating growth or reproduction effects that were cited in USEPA, 2008.

For mammalian species, the geomean of growth and NOAEL results was calculated to be 2.40 mg/kg-body weight/day based on nine growth studies (no NOAEL values were reported for reproduction effects) while the geomean for LOAEL effects on mammalian growth and reproduction was 58.2 mg/kg-BW/day (based on five studies). The mammal test species included rat (*Rattus norvegicus*), mouse (*Mus musculus*), pig (*Sus scrofa*) and cattle (*Bos taurus*). None of the 14 total trivalent chromium studies cited in USEPA (2008) that investigated growth or reproduction effects reported both a NOAEL and LOAEL result.

2.4.2 Vanadium

Information on the toxicity and biological fate of vanadium is limited. Vanadium is not considered to be a bioaccumulative compound of concern in the aquatic environment (USEPA, 2000). A Tier II secondary chronic value of 19.1 µg/L is presented for vanadium while the secondary acute value is listed as 284 µg/L (Suter, 1996). The lowest chronic surface water values for fish and daphnids are reported as 80 µg/L and >980 µg/L, respectively (Suter, 1996). Concentrations of vanadium in sediment that may affect aquatic receptors are not available.

USEPA (2005b) presents the results of toxicity studies conducted on avian and mammalian test species regarding biochemical, behavior, pathology, physiology, growth, reproduction, and survival effects for various doses of vanadium compounds. For avian species, the geomean of growth and reproduction NOAEL results was calculated to be 1.19 mg/kg-body weight/day based on 32 results while the geomean for LOAEL effects on avian growth and reproduction was 1.70 mg/kg-BW/day (based on 60 studies).

Almost all of the avian studies were conducted on the domestic chicken. The only two studies that did not test responses of chickens to administered vanadium doses involved Japanese quail (*Coturnix japonica*). The studies involving Japanese quail reported much greater NOAEL results on growth and reproduction than the tests involving the domestic chicken (generally an order of magnitude or greater than results reported for the chicken). In a survival study conducted with mallard ducks, individuals were exposed to vanadyl sulfate in their diet for 12 weeks. The NOAEL for mortality was 12 mg/kg-BW/day (White and Dieter, 1978 in USEPA, 2005b).

For mammalian species, the geomean of growth and reproduction NOAEL results was calculated to be 5.92 mg/kg-body weight/day based on 20 growth studies and 1 reproduction effect study. The geomean for LOAEL effects on mammalian growth and reproduction was 9.44 mg/kg-BW/day (based on results of 20 studies). The mammal test species included rat, mouse, pig and sheep (*Ovis aries*).

2.5 Complete Exposure Pathways

A variety of exposure pathways may potentially affect ecological receptors in the vicinity of the Site. Aquatic organisms such as macroinvertebrates that inhabit the aquatic habitat provided by the Hudson Branch adjacent to and downstream of the Site are directly in contact with COPECs present in surface water and sediment and/or potentially feed on organisms residing there. For these aquatic habitats, additional exposure pathways potentially exist to higher trophic level receptors that forage on vegetation or macroinvertebrates present in these areas. Ingestion of bioaccumulative contaminants of concern (USEPA, 2000) present within their prey as well as via incidental sediment ingestion are viable exposure routes for these higher trophic levels.

Although fish are likely present within limited portions of the Hudson Branch, fish populations are unlikely to be significant to support piscivorous receptors. The small size of the stream and shallow depths present throughout most of its length preclude the presence of significant fish populations that would provide a forage base for piscivorous wildlife.

Portions of the SMC Facility itself as well as adjacent downgradient terrestrial/wetland areas are vegetated and provide habitat for a variety of wildlife including insectivorous species such as shrews and American robin. The Revised SLERA concluded that these terrestrial receptors may be at risk from COPECs (i.e., chromium and vanadium) present at the eastern storage areas and Hudson Branch wetland due to potential ingestion of contaminated invertebrates that have bioaccumulated elevated levels of contaminants within their tissues from impacted surface soils. In addition, these receptors may also be exposed to surface soil COPECs through incidental ingestion of soil during foraging, grooming or preening activities.

Exposure of biota to subsurface soils and airborne contaminants (through volatization or fugitive dust emissions) via inhalation or dermal contact are not expected to represent as significant a pathway as direct ingestion of contaminated media or ingestion of contaminated biota in the food chain. Ecological receptors are also not anticipated to be directly exposed to groundwater contaminants although the evaluation of surface water and sediment within the adjacent aquatic habitat of the Hudson Branch indirectly evaluates contaminants possibly transported through ground water discharge.

A complete exposure pathway exists if the ecological receptors have contact with the COPEC in one or more medium and there is an exposure route (ingestion, direct contact) to the receptor. Organisms most likely to receive potential exposures to site COPECs are those whose activities frequently bring them into direct contact with sediment and surface soil or that feed upon species possessing one or both of these characteristics. Representative species were selected in the Revised SLERA (TRC, 2011) as indicators for exposure evaluation to represent various components of the food chain present in the vicinity of the Site.

2.6 Site Conceptual Model

The site conceptual model developed for the Site is based primarily on the information previously presented in the above sections concerning the environmental setting, contaminant toxicity as well as fate and transport characteristics, and the complete exposure pathways that were identified. Figure 2-8 presents a simplified conceptual model for the Site. Primary and secondary ecological receptors and important exposure pathways are identified for both aquatic and terrestrial/wetland habitats present within the Site.

Past activities associated with the operations at the Site may have resulted in contamination of the aquatic and terrestrial/wetland habitats as represented by the Hudson Branch, eastern storage areas, southern area, and Hudson Branch wetlands. Important components of the ecological community within these areas include plants, insects and other invertebrates, amphibians, reptiles, birds and mammals that represent a diverse assemblage of feeding guilds. The contaminants detected within the surface water, sediments and surface soils of the Site may potentially affect ecological receptors directly via contact (e.g., benthic community inhabiting contaminated sediments) or they may bioaccumulate within vegetation and/or invertebrates that are subsequently consumed by receptors occupying higher trophic levels within the habitats of the Site.

2.6.1 Assessment Endpoints

Assessment endpoints represent an expression of an ecological attribute that is to be protected. The selection of the BERA assessment endpoints considered the following:

- Existing habitats and species potentially present at the site;
- Contaminants present and their concentrations;
- Modes of toxicity to various receptors by contaminants;
- Ecologically relevant receptors that are potentially sensitive or likely to be highly exposed to life history attributes;
- Potentially complete exposure pathways; and,

- Results of the Revised SLERA.

Table 2-3 presents the assessment endpoints that were selected for the BERA that represent important components of the aquatic and terrestrial/wetland communities identified at or in the vicinity of the Site. The selected assessment endpoints represent both community level endpoints (e.g., benthic macroinvertebrate diversity and productivity) and population level endpoints (e.g., survival, growth and reproduction of particular guilds such as insectivorous birds). The assessment endpoints selected for the BERA are:

Aquatic Invertebrate Community Diversity and Abundance

Aquatic invertebrates present within the Hudson Branch may be adversely affected by the presence of contaminants within the surface water and the sediment. Concentrations of COPECs in the surface water and/or sediment of the Hudson Branch adjacent to and downstream of the SMC Facility may result in lower populations or biomass of invertebrates through increased mortality or a reduction in their growth and/or reproduction. The proposed assessment endpoint is:

> Protection of the aquatic invertebrate community from toxic effects that could adversely affect their diversity or abundance through direct exposure to contaminants present within surface water or sediment that are associated with the Site.

Mammalian Aquatic Herbivore Survival, Reproduction, and Growth

Mammalian species associated with the Hudson Branch may forage and consume plants within this aquatic habitat. Aquatic plants may accumulate contaminants within their tissues and be consumed by herbivorous species resulting in potentially toxic effects. In addition, surface water and sediment associated with these aquatic habitats may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of herbivorous mammals from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of vegetation as well as incidental ingestion of contaminated surface water/sediment.

Avian Aquatic Herbivore Survival, Reproduction, and Growth

Avian species associated with the Hudson Branch may forage within or along the aquatic habitat for vegetation. Plants (including seeds/tubers) may accumulate contaminants within their tissues and be consumed by receptor species resulting in potentially toxic effects. In addition, surface water and sediment associated with these aquatic habitats may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of herbivorous birds from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of vegetation as well as incidental ingestion of contaminated surface water and sediment.

Semi-Aquatic Avian Insectivore Survival, Reproduction, and Growth

Avian species may forage extensively within or along the aquatic habitat provided by the Hudson Branch for aquatic macroinvertebrates (including recently emergent insects such as midges). Aquatic macroinvertebrates may accumulate COPECs within their tissues and be consumed by foraging insectivorous species resulting in potentially toxic effects. In addition, surface water associated with the Hudson Branch may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of insectivorous birds from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of aquatic invertebrates as well as incidental ingestion of contaminated surface water associated with the Site.

Semi-Aquatic Mammalian Insectivore Survival, Reproduction, and Growth

Mammalian species present in the vicinity of the Hudson Branch may forage above or along the aquatic habitats for aquatic macroinvertebrates (particularly on recently emergent insects such as midges/mayflies). Aquatic macroinvertebrates may accumulate COPECs within their tissues and be consumed by foraging insectivorous species resulting in potentially toxic effects. In addition, surface water associated with the Hudson Branch may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of insectivorous mammals from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of aquatic invertebrates that have bioacccumulated contaminants as well as incidental ingestion of contaminated surface water associated with the Site.

Terrestrial Plant Survival and Growth

Vegetation associated with the terrestrial/wetland habitats of the SMC Facility are exposed to COPECs present within the surface soils of the eastern storage areas, southern area and the Hudson Branch wetlands. Concentrations of COPECs in the surface soil within these areas may result in lower populations or biomass of terrestrial vegetation through increased mortality or a reduction in their growth. The proposed assessment endpoint is:

> Protection of terrestrial plants from toxic effects that could adversely affect their survival or growth through exposure to surface soil contaminants associated with the Site.

Avian Insectivore Survival, Reproduction and Growth

Birds present at the Site may forage within the terrestrial/wetland habitats on various organisms including terrestrial invertebrates (e.g., earthworms, beetles, ants). Terrestrial invertebrates may accumulate COPECs within their tissues and be consumed by foraging insectivorous or invertivorous avian species resulting in potentially toxic effects. In addition, surface soils associated with these terrestrial/wetland habitats may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of insectivorous birds from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of terrestrial invertebrates as well as incidental ingestion of contaminated surface soils resulting from past operations associated with the Site.

Mammalian Insectivore Survival, Reproduction and Growth

Mammals present within the Site may forage within the terrestrial/wetland habitats for terrestrial invertebrates (e.g., earthworms, beetles). Terrestrial invertebrates may accumulate COPECs within their tissues and be consumed by foraging insectivorous species resulting in potentially toxic effects. In addition, surface soils associated with the upland areas may be ingested by these receptors during their foraging activities. The proposed assessment endpoint is:

> Protection of insectivorous mammals from toxic effects that could adversely affect their survival, reproduction, or growth through exposure to contaminants from ingestion of terrestrial invertebrates as well as incidental ingestion of contaminated surface soils resulting from past operations associated with the Site.

2.6.2 Measurement Endpoints

Measurement endpoints are used to evaluate responses of each assessment endpoint exposed to a stressor (USEPA, 1997). The measurement endpoints proposed for the BERA are also presented in Table 2-3.

Community-based measurement endpoints were selected for community level assessment endpoints and evaluated via community toxicity values (e.g., surface water quality criteria, sediment benchmarks, vegetation screening values). In addition, sediment toxicity test results were used to assess potential impacts to the benthic macroinvertebrate community.

For population level endpoints that assess receptor guilds present within the exposure areas (as detailed in the site conceptual model), specific indicator species were selected to evaluate potential risks to these guilds. Specific indicator species selected for the BERA (based on the results of the Revised SLERA) include the muskrat (*Ondatra zibethicus*), mallard (*Anas platyrhynchos*), tree swallow (*Tachycineta bicolor*), little brown bat (*Myotis lucifugus*), American robin (*Turdus americana*) and short-tailed shrew (*Blarina brevicauda*).

For the aquatic habitat provided by the Hudson Branch, the muskrat and mallard represent herbivorous receptors while the tree swallow and little brown bat represent insectivorous species that may forage on recently emerged aquatic insects above the Hudson Branch. The muskrat and mallard may also ingest sediment as they forage on vegetation within the Hudson Branch. All four of these indicator species receive addition exposure through ingestion of surface water. The estimated contaminant exposure doses for each of these species will be compared to the chronic Maximum Acceptable Toxicant Concentration (MATC) and LOAEL survival, reproductive, or growth effect levels reported in the literature. The MATC TRV represents the geometric mean of the NOAEL and LOAEL TRVs. Exceeding the chronic MATC indicates effects are possible while doses that exceed the chronic LOAEL indicate effects may be expected.

Avian and mammalian insectivores represented by the American robin and short-tailed shrew are exposed to surface soil COPECs either directly via soil ingestion or indirectly by preying on invertebrates that have accumulated COPECs within their tissues. Estimated contaminant exposure doses for each of these indicator species will be compared to chronic MATC and LOAEL survival, reproductive, or growth effect levels reported in the literature. An exposure dose that exceeds the chronic MATC indicates effects are possible while doses that exceed the chronic LOAEL indicate effects may be expected.

For each of the individual indicator species discussed above, the assessment endpoint references an impact on survival, growth or reproduction of a population. Adverse effects on populations can be inferred from measures associated with impaired survival, growth or reproduction.

3.0 BERA TOXICITY TESTING AND TISSUE SAMPLING

Field tissue residue studies with aquatic vegetation and aquatic and terrestrial invertebrates were proposed following completion of the Revised SLERA to further evaluate the potential for the identified COPECs to adversely affect aquatic macroinvertebrates, herbivorous and/or insectivorous birds and mammals.

3.1 Sediment Toxicity Testing

The Revised SLERA concluded that concentrations of various inorganics within sediment samples collected from the Hudson Branch are substantially elevated over levels associated with probable adverse effects to benthic macroinvertebrates. Previous testing of sediments at the Site that were conducted by TRC (as well as other sites in the Pinelands region) have concluded that the amphipod *Hyalella azteca* is a sensitive test organism for metals and is more suitable that a midge species (e.g., *Chironomus tentans*).

In order to evaluate the toxicity of these elevated concentrations to aquatic macroinvertebrates and to assist in determining appropriate remediation goals for Hudson Branch sediment (if necessary), laboratory testing of six sediment samples collected in October 2011 within the Hudson Branch and two sediment samples within the Burnt Mill Branch (reference area) were conducted using *H. azteca*. Exposure by *H. azteca* to sediments was conducted by Aquatec Biological Sciences during a chronic 42-day test period after which survival, growth (by dry weight), and reproduction (number of neonates/female) were evaluated for each of the sediment samples. The laboratory toxicity testing was conducted in accordance with Test Method EPA/600/R-99/064 Method 100.4.

Based on previous sampling results, sediment sampling locations that were selected for toxicity testing contain a range of COPEC concentrations that can be used to evaluate the effects of the sediment concentrations to aquatic macroinvertebrates. Sediment was collected at each sampling location for the toxicity tests as well as for chemical analyses (TCL SVOCs, TCL Pesticides/PCBs, TAL metals, TOC, particle grain size, and pH). The sampling locations within the Hudson Branch included SD-10, SD-13, SD-15, SD-18, SD-04 and SD-23 while the reference area samples collected from Burnt Mill Branch included SD-31 and SD-35. The locations of these samples are depicted on Figure 2-5.

Results of the sediment toxicity testing are discussed in Section 4.2 of the BERA. The laboratory toxicity test report is provided in Appendix D.

3.2 Biota Tissue Sampling

The field tissue study was conducted to assess the bioavailability of the COPECs by measuring COPEC concentrations in foods (aquatic vegetation, aquatic invertebrates, and terrestrial invertebrates) consumed by the assessment endpoints (herbivorous and insectivorous birds and mammals). Sediment or surface soil samples were collected at the same locations as the field tissue samples in order to develop an understanding of the relationship between the COPEC concentrations in the environmental medium and the organisms (i.e., bioaccumulation factor). Samples of aquatic vegetation and aquatic/terrestrial invertebrates were collected across a gradient of COPEC surface soils concentrations in order to develop site-specific bioaccumulation factors (BAFs). These bioaccumulation factors were then used in the BERA to estimate aquatic vegetation, aquatic invertebrate and terrestrial invertebrate COPEC concentrations throughout the Site and to estimate COPEC exposure by the selected assessment endpoints.

All biota tissue samples and co-located sediment or surface soil samples were collected from the Site during October 2011. Each sample was labeled with the sample location and date of collection. Invertebrate types collected at each sampling location and their relative percent contribution to the sample was recorded. Invertebrates were identified in the field to the lowest practicable taxon. Samples were placed on ice in a cooler and transferred to a freezer as soon as possible. Analytical results for the aquatic vegetation, aquatic invertebrate and terrestrial invertebrate samples are presented in Tables A-8, A-9 and A-10, respectively, of Appendix A.

3.2.1 Aquatic Vegetation

Eight aquatic plant tissue samples were collected from the Hudson Branch while two additional samples were collected from Burnt Mill Branch as reference samples. Sediment samples were collected at the same location as the aquatic vegetation samples. The purpose of the aquatic vegetation tissue study was to assess the bioavailability of chromium by measuring chromium concentrations in foods (aquatic vegetation) consumed by the assessment endpoints (semi-aquatic herbivorous birds and mammals). Both sediment and aquatic plant samples were analyzed for chromium (total). Aquatic vegetation samples included plants that are rooted into sediment and, if present, represent foods consumed by foraging muskrats and/or mallards. Examples of forage plants collected included smartweed (*Polygonum* spp.), cattail (*Typha latifolia*), and water cress (*Nasturtium* sp.). Samples were collected in the field using stainless steel scissors and the samples placed in Ziploc bags. Each sample was labeled with the sample location and date of collection. A field notebook recorded vegetation collected at the sampling location. Samples were placed on ice in a cooler and transferred to a freezer as soon as possible.

The sampling results for the sediment and aquatic vegetation samples are presented in Table 3-1. The selected locations represent a range of chromium concentrations detected in the Hudson Branch sediment samples. Based on the results of the aquatic vegetation and sediment samples, a site-specific aquatic vegetation:sediment bioaccumulation factor was determined. This bioaccumulation factor will then be applied to the mean and mean UCL sediment chromium concentrations to obtain a mean and mean UCL aquatic vegetation chromium concentration for estimating exposure by the selected indicator species (muskrat and mallard).

A scatterplot of the plant and sediment concentrations for each Hudson Branch sample is presented in Appendix E. There was little correlation ($r^2 = 0.0091$) between concentrations of chromium detected in aquatic vegetation samples and the corresponding sediment samples. Therefore, similar to the approach used in the derivation of plant:soil BAFs, (USEPA, 2007b), the median value of the sample-specific BAFs for chromium was selected to represent the Site BAF. The median Site-specific plant:sediment BAF calculated for chromium is 0.136.

3.2.2 Aquatic Invertebrates

Eight aquatic invertebrate samples were collected from the Hudson Branch while two additional reference samples were collected from Burnt Mill Branch. The sampling locations were the same as selected for the aquatic vegetation samples. Sediment samples were collected in the immediate vicinity of the aquatic invertebrate samples. The purpose of the aquatic invertebrate tissue study was to assess the bioavailability of the COPECs (i.e., antimony, barium, chromium, copper, mercury and vanadium) by measuring COPEC concentrations in foods (aquatic invertebrates) consumed by the assessment endpoints (insectivorous birds and mammals). Aquatic invertebrate samples preferentially included aquatic insect species that are emergent species that may be consumed by foraging aerial insectivores. Examples of emergent insect species include mayflies (Ephemeroptera), stoneflies (Plecoptera) and damselflies/dragonflies (Odonata).

Aquatic invertebrates were collected using a D-Frame aquatic net. Each sample was collected as close as possible to its associated sediment sample. The invertebrates were identified in a sorting tray, rinsed with deionized water, and placed into clean sampling jars. Each sample was labeled with the sample location and date of collection. A field notebook recorded invertebrate types collected at the sampling location and their relative contribution to the sample. Invertebrates were identified in the field to the lowest practicable taxon. Samples were placed on ice in a cooler and transferred to a freezer as soon as possible.

Based on the results of the aquatic invertebrate and sediment samples, a site-specific aquatic invertebrate:sediment bioaccumulation factor was determined. This bioaccumulation factor will then be applied to the mean and mean UCL sediment COPEC concentrations to obtain a mean and mean UCL aquatic invertebrate COPEC concentration for estimating exposure by the little brown bat and tree swallow.

The sampling results for the sediment and aquatic invertebrate samples are presented in Table 3-2. The selected locations represent a range of COPEC concentrations detected in the Hudson Branch sediment samples. Based on the results of the aquatic invertebrate and sediment samples, site-specific aquatic invertebrate:sediment bioaccumulation factors were determined except for antimony which was not detected in any of the aquatic invertebrate samples. Therefore, a BAF of 0.0 is assumed for antimony. The calculated bioaccumulation factors for the remaining COPECs will then be applied to the mean and mean UCL sediment COPEC concentrations to obtain mean and mean UCL aquatic invertebrate COPEC concentrations for estimating exposure by the selected indicator species (little brown bat and tree swallow).

A scatterplot of the aquatic invertebrate and sediment concentrations for each Hudson Branch COPEC is presented in Appendix E. There was little correlation ($r^2 < 0.1689$ for all COPECs) between concentrations of COPECs detected in aquatic invertebrate samples and the corresponding sediment samples. Therefore, similar to the approach used in the derivation of aquatic invertebrate:sediment BAFs, (USEPA, 2007b), the median value of the sample-specific BAFs for each COPEC was selected to represent the Site BAF. The median Hudson Branch-specific aquatic invertebrate:sediment BAFs calculated for barium, chromium, copper, mercury and vanadium are 0.198, 0.046, 0.313, 0.270, and 0.435, respectively.

3.2.3 Terrestrial Invertebrates

Six terrestrial invertebrate samples were each collected from the eastern storage areas and Hudson Branch wetland while two additional invertebrate samples were collected at reference locations. Surface soil samples were collected at the location of the terrestrial invertebrate samples. The purpose of the terrestrial invertebrate tissue study was to assess the bioavailability of the COPECs (i.e., chromium and vanadium) by measuring COPEC concentrations in foods (terrestrial invertebrates) consumed by the assessment endpoints (invertivorous birds and mammals). Surface soil and terrestrial invertebrate samples were analyzed for chromium and vanadium.

Terrestrial invertebrate samples preferentially included earthworms that may be consumed by foraging invertivores although several samples also included beetle larvae (grubs) or crickets/grasshoppers if earthworms were scares or absent. Sample collection was conducted with stainless steel spoons/shovels and involved placing soil into a large stainless steel sampling bowl where invertebrates were separated and placed into glass jars. Any invertebrate retained for sampling was free of loose soil and detritus. Each sample was labeled with the sample location and date of collection. A field notebook recorded invertebrate types collected at the sampling location and their relative contribution to the sample. Samples were placed on ice in a cooler and transferred to a freezer as soon as possible.

The sampling results for the surface soil and terrestrial invertebrate samples within both the Hudson Branch wetland and eastern storage areas are presented in Table 3-3. Based on the results of the terrestrial invertebrate and surface soil samples, site-specific terrestrial invertebrate:sediment BAFs were determined for both the Hudson Branch wetland and eastern storage areas. The calculated BAFs for chromium and vanadium will then be applied to the mean and mean UCL surface soil chromium and vanadium concentrations to obtain mean and mean UCL terrestrial invertebrate chromium and vanadium concentrations for estimating exposure by the selected indicator species (short-tailed shrew and American robin).

A scatterplot of the terrestrial invertebrate and surface soil concentrations for chromium and vanadium samples collected within the eastern storage areas and the Hudson Branch wetland are presented in Appendix E. For the eastern storage area samples, there was little correlation ($r^2 < 0.124$) between concentrations of chromium and vanadium detected in terrestrial invertebrate samples and the corresponding surface soil samples. Therefore, similar to the approach used in the derivation of terrestrial invertebrate:soil BAFs, (USEPA, 2007b), the median value of the sample-specific BAFs for chromium and vanadium was selected to represent the eastern storage areas BAF. The median eastern storage areas-specific terrestrial invertebrate:soil BAFs calculated for chromium and vanadium are 1.192 and 0.220, respectively.

For the wetlands associated with the Hudson Branch, the results of the terrestrial invertebrate sampling and surface soil sampling indicate that concentrations of soil COPECs (chromium and vanadium) are strongly correlated ($r^2 > 0.80$ for both chromium and vanadium) with concentrations of COPECs in terrestrial invertebrate tissues. Linear regression (including forcing the y-intercept through 0.0 of x/y axis) results in chromium and vanadium BAFs of 0.338 and 0.361, respectively.

4.0 RISK CHARACTERIZATION

Quantitative risk estimates for this BERA were calculated using the hazard quotient (HQ) approach, which compares the exposure estimates with the applicable ecotoxicity benchmark. The hazard quotient is expressed as the ratio of the exposure estimate, represented by the maximum environmental media concentration (e.g., sediment) or the maximum estimated exposure dose for the wildlife indicator species, to the ecotoxicity benchmark (i.e., TRV).

If the calculated hazard quotient is one or less, then it is unlikely that that COPEC will result in an adverse effect on that measurement receptor. Conversely, a hazard quotient greater than one indicates that that particular measurement receptor may be at risk of an adverse effect from that COPEC. For the wildlife indicator species, a hazard index (HI) is also calculated based on the sum of the COPEC-specific HQs to determine the risk from multiple stressors. It is important to note that HQs provide only a general characterization of potential impacts to the local biota. An HQ less than one is indicative of non-risk, however, an HQ greater than unity does not in itself represent an unacceptable risk. Other site-specific factors (e.g., bioavailability) present at the Site may affect the initial screening calculation. The calculated risk estimates are discussed below.

4.1 Aquatic Macroinvertebrate Community

A variety of surface water and sediment COPECs including carbazole, phthalates, PAHs, total PCBs, the pesticides dieldrin and 4,4'-DDT (and its derivatives), and 19 inorganics were identified as potentially posing a risk to the aquatic invertebrate community inhabiting the Hudson Branch (including Burnt Mill Pond). Each of these analytes was either detected in surface water or sediment samples at a concentration greater than their ecological screening values or these analytes do not have a sediment screening value available to compare to the detected sediment concentrations. The assessment of surface water and sediment COPECs included a comparison with applicable TRVs as well as a comparison to reference area concentrations. The results are presented below.

4.1.1 Surface Water Risks

4.1.1.1 Comparison to TRVs

The maximum detected total and/or dissolved concentrations of aluminum, chromium, copper, iron, manganese, and vanadium detected in the Hudson Branch surface water samples exceed aquatic invertebrate/fish surface water screening values. Aquatic invertebrates (as well as other organisms such as fish) present within the aquatic habitats provided by the Hudson Branch may be exposed to surface water contaminants. A review of additional toxicity data for these COPECs was conducted and included other water quality criteria (e.g., acute criteria), alternative screening values as well as additional effects levels reported in the scientific literature. Available toxicity data include both chronic and acute studies relating to adverse effects to aquatic invertebrates and fish. The surface water TRVs for the aquatic invertebrate/fish community are presented in Table 4-1.

Lowest chronic values for invertebrates (daphnids and nondaphnid invertebrates) and fish were derived from Suter (1996) and represent chronic ambient water quality criteria for invertebrates and fish (based on actual chronic test results with invertebrates/fish) or are estimated based on the available acute toxicity test data (Suter, 1996). Another invertebrate benchmark obtained from Suter (1996) is the test daphid EC20 which represents the highest tested concentration resulting in less than a 20% reduction in the growth, fecundity or survival of daphnids through chronic exposure. The EC20 daphid benchmarks are intended to represent chronic indices of daphnid population production (Suter, 1996). The USEPA Ecotox database was also reviewed to obtain additional toxicity data for various invertebrate species. In addition to the invertebrate-specific TRVs, water quality criteria (acute and chronic) were included as applicable TRVs. The chromium and copper criteria were based on the mean water hardness (47.15 mg/L) of the surface water samples collected from the Hudson Branch. For most metals, the dissolved concentration represents the bioavailable portion for ecological receptors. Therefore, dissolved concentrations of chromium, copper, iron, manganese and vanadium were compared to their surface water TRVs. However, the total concentration of aluminum is used to evaluate surface water toxicity for this inorganic (USEPA, 2009).

A comparison of the mean surface water concentrations of these COPECs with their respective surface water TRVs was conducted (Table 4-2). The number of surface water samples that detected each COPEC above its respective surface water TRV is also identified in Table 4-2. The mean detected concentrations of aluminum, chromium, copper, iron, manganese and vanadium in surface water samples collected from the Hudson Branch exceed one or more of their surface water TRVs. The mean total concentration of aluminum exceeds its chronic water quality criterion while mean dissolved concentrations of copper and iron are below their chronic water quality criteria. Mean dissolved concentration of chromium exceeds the New Jersey chronic water quality criterion but is below the USEPA recommended chronic water quality criterion. Mean dissolved concentrations of manganese and vanadium exceed their respective Tier II secondary chronic values (62 percent of samples detected these COPECs above this TRV) but are less than their Tier II secondary acute values.

Copper and iron were both detected above their respective chronic water quality criteria in 2 of the 13 surface water samples collected from the Hudson Branch. Copper also slightly exceeded its acute water quality criterion in one sample. One of 13 surface water samples detected chromium at a concentration greater than the USEPA recommended chronic water quality criterion. The locations where these water quality criteria were exceeded include surface water samples SW-01 and SW-13, both of which are located within the upstream portion of the Hudson Branch that is situated on the Site. Concentrations of these COPECs generally decrease in samples located further downstream of the Site and do not exceed their chronic water quality criteria.

4.1.1.2 Comparison to Reference Area

The surface water COPECs that were identified as potential risk drivers to the aquatic community (i.e., aluminum, chromium, copper, iron, manganese, and vanadium) were further refined by a statistical comparison of the Hudson Branch sampling results (i.e., Site) with the

Burnt Mill Branch surface water reference area sampling results. All statistical data and comparisons were derived using ProUCL Version 4.10.

The following null hypothesis (H_O) was tested: surface water concentrations collected within the Hudson Branch adjacent and down gradient of the Site are equal to or less than the reference area sample surface water concentrations collected from the Burnt Mill Branch. The statistical comparison was conducted using the Students Two-Sample t-Test or Satterthwaite t-Test (if unequal variance), the Quantile Test and/or the Wilcoxon-Mann-Whitney Rank Sum Test (equivalent to the Wilcoxon Rank Sum Test). The Satterthwaite t-Test was used on normally distributed data sets with unequal variance. Both the nonparametric Quantile Test and the Wilcoxon-Mann-Whitney Rank Sum Test were used for data sets not normally distributed or data sets containing non-detect values. The Quantile Test is first used to determine whether upper concentrations of the site data distribution are comparable to the reference sample data distribution. Based on this initial comparison, either the null hypothesis (H_O) is rejected or a comparison between site and reference sample data is conducted using the Wilcoxon-Mann-Whitney Rank Sum Test. A description of each data set and the statistical test used to compare the Hudson Branch and reference area surface water sampling data are presented in Table 4-3.

Statistical comparisons of several COPECs (chromium, copper and vanadium) could not be conducted because these COPECs were either not detected or detected infrequently in the reference area samples. Therefore, these COPECs are considered to be present at greater concentrations than the reference area concentrations.

Results of the statistical evaluation for the remaining COPECs (aluminum, iron and manganese) are presented in Table 4-4. Based on the statistical comparison to reference sample concentrations, the concentrations of dissolved iron in surface water samples from the Hudson Branch exceed levels observed in the Burnt Mill Branch reference area surface water samples while the concentrations of total aluminum and dissolved manganese within the Hudson Branch are no greater than the reference area surface water concentrations.

4.1.1.3 Surface Water Risk Summary

Chromium, copper, iron, and vanadium were identified as COPECs that are present in Hudson Branch surface water at concentrations that exceed reference area concentrations and exceed one or more of their respective TRVs. Copper was detected above its chronic water quality criterion in 2 of the 13 surface water samples collected from the Hudson Branch and exceeded its acute water quality criterion in 1 sample. Chromium and iron were detected above their respective chronic water quality criteria (USEPA, 2009) in only 1 and 2 samples, respectively. The highest detected concentration for each of these COPECs was noted at surface water sample SW-1 which was collected at the small pond at the SMC facility. Vanadium exceeds its Tier II secondary chronic value at 8 of 13 sampling locations within the Hudson Branch. These samples extend from the SMC facility downstream to Burnt Mill Pond. However, the lowest chronic value for fish (80 µg/L) was not exceeded at any of the surface water samples and four additional vanadium TRVs were also not exceeded at any of the sampling locations. Although adverse chronic effects to sensitive components of the aquatic biota inhabiting the Hudson Branch may occur from detected concentrations of vanadium, the risk is uncertain as other TRVs including the lowest chronic values for daphnids and fish (Suter, 1996) were not exceeded at any surface water sampling location.

4.1.2 Sediment Risk Considerations

4.1.2.1 Comparison to TRVs

The sediment concentrations of COPECs were compared to their Threshold Effect Concentration (TEC) benchmarks as well as their respective Probable Effect Concentration (PEC). The TEC represents a consensus-based freshwater benchmark below which adverse effects on benthic organisms are not expected (MacDonald *et al*., 2000). TECs essentially reflect the geometric mean of previously published sediment quality benchmarks that were developed as threshold guidelines for predicting toxicity to sediment-dwelling biota. These previously published guidelines include Threshold Effect Levels (TELs from Smith *et al*., 1996), Lowest Effect Levels (LELs from Persaud *et al*., 1993), Effects Range – Low (ER-Ls from Long and Morgan, 1991), Minimal Effect Thresholds (METs from EC, 1992), and chronic thresholds developed via the equilibrium partitioning approach (USEPA, 1997b). The resulting consensus-based TECs were then evaluated to determine their predictive ability to classify sediments as toxic or non-toxic (MacDonald *et al*., 2000). This evaluation concluded that sediment concentrations below the TECs had a low incidence of sediment toxicity and the TECs present an accurate basis for predicting the absence of adverse effects to benthic organisms inhabiting freshwater sediment (MacDonald *et al*., 2000).

The PEC represents a consensus-based freshwater benchmark above which adverse effects on benthic organisms are expected (MacDonald et al., 2000). PECs reflect the geometric mean of five previously published sediment quality benchmarks that were developed as guidelines for predicting toxicity to sediment-dwelling biota. These previously published benchmarks include Probable Effect Levels (PELs from Smith et al., 1996), Severe Effect Levels (SELs from Persaud et al., 1993), Effects Range – Median values (ER-Ms from Long and Morgan, 1991), and Toxic Effect Thresholds (TETs from EC, 1992). If a PEC was not available for a COPEC, then the SEL or ER-M benchmarks were selected. PECs were available for most COPECs. The SELs represent sediment concentrations where significant impacts to the benthic invertebrate community are anticipated. The SELs for organic contaminants are adjusted for the mean total organic carbon (TOC) content of the sediment (5.4%). Sediment benchmarks are presented in Table 4-5.

A comparison of mean detected COPEC concentrations with their respective sediment benchmarks is provided in Table 4-6. The number of sediment samples that detected each COPEC above its respective sediment TRVs is also identified in Table 4-6. The mean concentrations of nine PAHs, 4,4-DDD, 4,4'-DDE, total PCBs, and eight inorganics (antimony, cadmium, chromium, copper, lead, mercury, nickel and zinc) were greater than their respective TEC TRVs. Most of these COPECs have mean concentrations two or less times their respective TEC TRV. However, mean concentrations of chromium and nickel exceed their TEC TRVs by factors of 44 and 6, respectively.

The mean sediment concentrations of chromium and nickel represent the only COPECs that exceed their respective PEC TRVs. Chromium and nickel were detected at concentrations above their respective PEC TRV in 30 and 20 of 39 samples, respectively. Other COPECs that had one or more sample with a concentration above its PEC TRV included 4,4-DDD (1 of 17 samples), antimony (3 of 29 samples), arsenic (1 of 33 samples), copper (7 of 39 samples), lead (9 of 39 samples), mercury (6 of 39 samples), and zinc (1 of 39 samples). PCBs and SVOCs were not detected in any sample at a concentration that exceeds their PEC TRV.

Therefore, although adverse effects to sensitive components of the benthic community inhabiting the Hudson Branch adjacent and downgradient of the SMC Facility are possible due to sediment COPEC concentrations of these constituents that exceed their TEC TRVs, risks are somewhat uncertain as the COPEC concentrations for most constituents are below levels associated with probable effects to the benthic community. However, concentrations of chromium and nickel and to a lesser extent, copper, lead and mercury are also of concern to aquatic macroinvertebrates inhabiting the Hudson Branch.

4.1.2.2 Comparison to Reference Area

A number of COPECs could not be evaluated as sediment TRVs are unavailable for these COPECs (i.e., barium, beryllium, calcium, magnesium, potassium and vanadium). These COPECs as well as the pesticide and inorganic COPECs that were identified as potential risk drivers to the aquatic macroinvertebrate community (i.e., dieldrin, 4,4-DDT and its derivatives, and 17 inorganics – all detected inorganics except silver which was not detected in any sample above its ER-L TRV) were further refined by a statistical comparison of the Hudson Branch sampling results (i.e., Site) with the Burnt Mill Branch sediment sampling results. All statistical data and comparisons were derived using ProUCL Version 4.10.

The following null hypothesis (H_O) was tested: sediment concentrations collected within the Hudson Branch adjacent and down gradient of the Site are equal to or less than the reference area sample sediment concentrations collected from the Burnt Mill Branch. The statistical comparison was conducted using the Students Two-Sample t-Test or Satterthwaite t-Test (if unequal variance), the Quantile Test and/or the Wilcoxon-Mann-Whitney Rank Sum Test (equivalent to the Wilcoxon Rank Sum Test). The Satterthwaite t-Test was used on normally distributed data sets with unequal variance. Both the nonparametric Quantile Test and the Wilcoxon-Mann-Whitney Rank Sum Test were used for data sets not normally distributed or data sets containing non-detect values. The Quantile Test is first used to determine whether upper concentrations of the site data distribution are comparable to the reference sample data distribution. Based on this initial comparison, either the null hypothesis (H_O) is rejected or a comparison between site and reference sample data is conducted using the Wilcoxon-Mann-Whitney Rank Sum Test. A description of each data set and the statistical test used to compare the Hudson Branch and reference area surface water sampling data are presented in Table 4-7.

Statistical comparisons of several COPECs (dieldrin, antimony, arsenic, cadmium, magnesium, potassium and vanadium) could not be conducted because these COPECs were either not detected or detected infrequently in the reference area samples. Therefore, all of these COPECs except dieldrin are considered to be present at greater concentrations than the reference area concentrations. Dieldrin was detected infrequently in samples collected from the Hudson Branch and the Burnt Mill Branch (detected in less than 25 percent of samples at each area) while the mean and maximum detected samples were noted in the reference area samples.

Results of the statistical evaluation for the remaining COPECs are presented in Table 4-8. Based on the statistical comparison to reference sample concentrations, the sediment concentrations of chromium, copper, lead, nickel and zinc in samples from the Hudson Branch exceed levels observed in the Burnt Mill Branch reference area sediment samples. Sediment concentrations of 4,4-DDT (and DDD/DDE), aluminum, barium, beryllium, calcium, iron and mercury were statistically similar between samples collected from the Hudson Branch and Burnt Mill Branch.

4.1.2.3 Sediment Toxicity Testing

Previous sediment toxicity testing was conducted in 2009 for four Hudson Branch sediment samples and a reference sample collected from the Burnt Mill Branch (TRC, 2009). Survival and growth of *Chironomus tentans* and *H. azteca* exposed to test sediments for 10 and 28 days, respectively, were evaluated by Aquatec Biological Sciences (same laboratory that conducted the 42-day *H. azteca* toxicity test discussed below). For *C. tentans*, significantly lower survival compared to the control sediment was observed in the reference sample collected from Burnt Mill Branch (SD-35) while significantly lower *C. tentans* growth was identified in three of the four Hudson Branch samples as well as the reference sediment location. Although elevated COPEC concentrations were present in the Hudson Branch sediment samples, the concentrations of COPECs in the reference sample (SD-35) were all below their respective PEC TRVs. No significant results were noted between any of the five sediment samples and the control sediment on *H. azteca* survival or growth. Results of the sediment toxicity testing including survival and growth results for *C. tentans* and *H. azteca* as well as COPEC concentrations are presented in Table 4-9a.

In order to further evaluate the toxicity of the elevated COPEC concentrations to aquatic macroinvertebrates, laboratory testing of six sediment samples collected from the Hudson Branch and two sediment samples within the Burnt Mill Branch (reference area) were conducted in 2011 using *Hyalella azteca*. Chronic exposure by *H. azteca* to sediments was conducted after which survival, growth (by dry weight), and reproduction (number of neonates/female) were evaluated for each of the sediment samples. Sediment was collected at each sampling location for the toxicity tests as well as for chemical analyses (TCL SVOCs, TCL Pesticides/PCBs, TAL metals, TOC, particle grain size, and pH). The sampling locations within the Hudson Branch included SD-10, SD-13, SD-15, SD-18, SD-04 and SD-23 while the reference area samples collected from Burnt Mill Branch included SD-31 and SD-35. Results of the sediment toxicity testing including survival, growth, reproduction results as well as COPEC concentrations are presented in Table 4-9b. The complete laboratory toxicity test report is provided in Appendix D.

Greatly reduced survival and reproduction were noted in the results from SD-18. Although a lower reproduction result was observed at SD-04 that was statistically significant from the control sample ($\alpha = 0.018$), the result was not statistically significant with SD-31 ($\alpha = 0.173$), a reference area sample collected from the Burnt Mill Branch. Overall, the toxicity test results from SD-18 are indicative of potentially significant impacts to benthic macroinvertebrates due to very high mortality and no reproduction of surviving females. Sediment COPECs detected at elevated concentrations above their PEC TRVs included chromium (2,580 mg/kg) and nickel (158 mg/kg). Although a TRV in unavailable for vanadium, the concentration detected at SD-18 (595 mg/kg) is substantially greater than reference area concentrations of this COPEC.

Two of the other Hudson Branch sediment samples (SD-13 and SD-15) tested for toxicity to *H. azteca* contained higher chromium and nickel concentrations than detected at SD-18 yet no adverse effects were noted on *H. azteca*. SD-18 was located south of Weymouth Road approximately 1,000 feet downstream of the SMC facility.

4.1.2.4 Sediment Risk Summary

Antimony, arsenic, cadmium, chromium, copper, lead, nickel and zinc were identified as COPECs that are present in Hudson Branch sediment at concentrations that exceed reference area concentrations and exceed one or more of their respective TRVs. Antimony, arsenic, cadmium, and zinc were infrequently (10 percent or less of samples) detected above their PEC TRV. Chromium, copper, lead and nickel were frequently detected in Hudson Branch sediment at concentrations above their PEC TRV (ranged from 18 percent of samples for copper to 77 percent of samples for chromium).

Chromium and nickel appear to represent the most significant metals that may impact benthic macroinvertebrates as greater than half of the samples collected from the Hudson Branch detected these metals at levels above their respective PEC TRV.

COPECs that do not have sediment TRVs but were detected above reference area sediment concentrations include magnesium, potassium and vanadium. Magnesium and potassium represent essential nutrients and would not be expected to significantly impact the benthic macroinvertebrate community. However, elevated concentrations of vanadium may potentially result in impacts to benthic macroinvertebrates. Other COPECs detected in Hudson Branch sediment samples at concentrations above their benthic macroinvertebrate TRVs include PAHs and total PCBs. These COPECs were all detected in less than half of the Hudson Branch sediment samples above their TEC TRV and were not detected in any samples above their PEC TRV.

Overall, the detected levels of chromium, nickel and/or vanadium within sediments of the Hudson Branch adjacent to or downgradient of the SMC facility substantially exceed their respective PEC TRVs and/or reference area concentrations indicating components of the aquatic macrobenthic community within portions of this aquatic habitat may potentially be adversely affected by high concentrations of these COPECs.

4.2 Semi-Aquatic Wildlife Receptors

Risks to the herbivorous muskrat and mallard and the insectivorous little brown bat and tree swallow from mean detected COPEC concentrations in the sediments of the Hudson Branch and transferred to their food (i.e., aquatic plants and invertebrates) were identified in the Revised SLERA (TRC, 2011). Aquatic plant and invertebrate tissue samples were collected as a component of the BERA to assess the bioconcentration of the COPECs (i.e., antimony, barium, chromium, copper, mercury and/or vanadium) into the respective foods consumed by the assessment endpoints (herbivorous and insectivorous birds and mammals). Estimated exposure doses were calculated based on exposure factors presented in Table 4-10.

4.2.1 Herbivore Exposure

The Revised SLERA identified chromium as a COPEC that may present a risk to foraging mammalian and avian herbivores. The median Site-specific plant:sediment BAF calculated for chromium is 0.136 (see Table 3-1). Estimated mean and the UCL of the mean concentrations of chromium within aquatic plants were calculated using the chromium BAF and the mean and the UCL of the mean chromium sediment concentrations. Estimated exposure doses for the muskrat and mallard based on the mean UCL and the mean sediment concentrations are presented in Tables 4-11.

4.2.2 Insectivore Exposure

The Revised SLERA identified antimony, barium, chromium, copper, mercury, and/or vanadium as COPECs that may present a risk to foraging mammalian and/or avian herbivores. The median Site-specific aquatic invertebrate:sediment BAFs calculated for these COPECs were discussed in Section 3.2.2 and presented in Table 3-2. Estimated mean and the UCL of the mean concentrations of COPECs within aquatic invertebrates were calculated using these BAFs and the mean and the UCL of the mean COPEC sediment concentrations. Estimated exposure doses for the little brown bat and tree swallow based on the mean UCL and the mean sediment concentrations are presented in Tables 4-12.

4.2.3 Risk Characterization

The estimated mean UCL and mean exposure doses ingested by the semi-aquatic receptor species were compared to avian and mammalian MATC TRVs. The MATC TRV represents the geometric mean of the NOAEL and LOAEL TRVs. LOAEL and NOAEL TRVs were derived from the same sources and represent the geometric means of the reproduction and growth results presented in the referenced sources. The avian and mammalian MATC TRVs are presented in Table 4-13.

Table 4-14 presents estimated risks to the herbivorous muskrat and mallard and the insectivorous little brown bat and tree swallow from the mean UCL and mean COPEC concentrations in the sediments of the Hudson Branch. Results for each of the four semi-aquatic receptors are discussed below.

4.2.3.1 Mammalian Herbivore

The mean UCL and mean HQs are 3 and 2, respectively, for the muskrat with respect to chromium and its MATC TRV. The mean estimated exposure dose of chromium ingested by the muskrat (34 mg/kg body weight (BW)/day) is less than the mammalian LOAEL TRV of 58.2 mg/kg BW/day indicating risks are somewhat uncertain as the MATC TRV was exceeded but not the LOAEL TRV. The estimated exposure dose of chromium ingested by the muskrat is primarily from aquatic plant ingestion. Plants contribute 85 percent of the total chromium exposure dose ingested by the muskrat with the remainder attributable to sediment ingestion. Overall, chromium is considered to present a slight risk potential to foraging mammalian herbivores within the Hudson Branch.

4.2.3.2 Avian Herbivore

HQs for the herbivorous mallard from mean UCL and mean chromium concentrations in the Hudson Branch sediment samples are 6 for the mean UCL exposure dose and 3 for the mean exposure dose. Approximately 85 percent of the total chromium exposure is due to plant ingestion. The mean exposure dose ingested by the mallard (21.5 mg/kg BW/day) exceeds the avian LOAEL TRV of 15.7 mg/kg BW/day. Therefore, chromium presents a potential risk to foraging avian herbivores within the Hudson Branch.

4.2.3.3 Mammalian Insectivore

Table 4-14 also presents the estimated risks to the insectivorous little brown bat from mean UCL and mean COPEC concentrations detected in the Hudson Branch sediment samples. The hazard index (sum of hazard quotients for all COPECs) is 13 for the mean UCL exposure dose and 10 for the mean exposure dose. The risk drivers under the mean exposure doses are vanadium (mean HQ = 7) and chromium (mean HQ = 2). Although the mean exposure dose of chromium ingested by the bat (18.9 mg/kg BW/day) is less than the mammalian LOAEL TRV of 58.2 mg/kg BW/day indicating risks are somewhat uncertain, the LOAEL TRV for vanadium (9.44 mg/kg BW/day) is exceeded by the mean estimated exposure dose ingested by the bat. The only other COPEC evaluated is antimony and that does not provide a potential risk (HQ = 0 since antimony was not detected in either aquatic invertebrates or surface water).

Nearly 100 percent of the chromium and vanadium ingestion by the bat is via invertebrate ingestion. Therefore, a potential risk exists to semi-aquatic mammalian insectivores foraging at the Hudson Branch primarily from the mean detected concentrations of vanadium in the sediment.

4.2.3.4 Avian Insectivore

The hazard index for the insectivorous tree swallow from mean UCL and mean sediment concentrations in the Hudson Branch are 197 under the mean UCL exposure dose and 92 under the mean exposure dose with risk driven primarily by vanadium (mean HQ = 82) and chromium (mean HQ = 8). HQs greater than unity were also calculated for mean UCL estimated doses of mercury (HQ = 2). The mean estimated exposure dose for mercury results in an HQ equal to 1 indicating a slight risk potential as the mean exposure doses of mercury ingested by the tree swallow is approximately equal to its MATC TRV. The mean HQs for barium and copper are both less than unity indicating little risk potential for these COPECs.

The tree swallow's exposure to chromium and vanadium is nearly 100 percent from aquatic invertebrate ingestion. Overall, a potential risk exists to aquatic avian insectivores foraging at the Hudson Branch from the mean concentrations of vanadium and chromium detected in the sediment.

4.3 Terrestrial/Wetland Plant Community

Risk to the terrestrial/wetland plant communities from the detected COPECs within the surface soil of the eastern storage areas, southern area and Hudson Branch wetlands were identified in the Revised SLERA (TRC, 2011) by comparing mean detected concentrations of the COPECs with TRV benchmarks generally associated with threshold effects to vegetation. COPECs that exceed their respective plant TRVs greater than approximately 20 percent of the samples may present a potential risk to the vegetation community inhabiting each of the evaluation areas as an ecologically significant component of the community may be affected by COPEC concentrations.

Manganese, nickel and vanadium concentrations within the eastern storage areas may potentially result in impacts to the plant community and were evaluated further in the BERA. For the southern area, vanadium concentrations within this area may potentially result in impacts to the plant community while surface soil concentrations of nickel and vanadium may present a risk to the plant communities associated with the Hudson Branch wetlands (TRC, 2011). In addition, risks to vegetation from elevated concentrations of chromium within these areas may present a risk to terrestrial plants, however, a plant TRV for evaluating this COPEC is unavailable.

The mean and maximum detected concentrations of the terrestrial plant COPECs (manganese, nickel and vanadium as well as chromium) were detected at much greater concentrations in terrestrial habitats of the Site compared to reference area samples (see Appendix B).

Further evaluation of terrestrial/wetland plant communities for this BERA considered evidence of stressed or dead vegetation as well as the presence of metals-tolerant species such as common reed (*Phragmites australis*) that may be indicative of metal phytotoxicity to other plants that were formerly present at greater densities.

Signs of dead or stressed vegetation were not observed in either the eastern storage areas or southern area during site visits and sampling events conducted in 2011 at the Site. Significant portions of both the eastern storage areas and southern area are comprised of Natural Resource Restoration Areas that were established in 1999 and 2000 to provide wildlife habitat value. These areas were established by importing soil then establishing vegetation. Species planted include: pitch pine (*Pinus rigida*), chestnut oak (*Quercus prinus*), red oak (*Quercus rubra*), and persimmon (*Diospyros birginiana*). Vegetation within the eastern storage areas and southern area includes a variety of herbaceous plants including grasses, trees, and shrubs. In addition to providing natural resource value, these areas were intended as a cap to address potential soil contamination at these locations. Due to the absence of phytotoxicity effects and the presence of planted species that are continuing to provide wildlife habitat within the eastern storage areas and southern area, risks to the terrestrial plant communities within these areas are concluded to be low.

Although direct evidence of phytotoxic effects within the Hudson Branch wetland were also not observed, the presence of wetland areas dominated by the metal-tolerant common reed plant may indicate that the plant community has previously been impacted by metals contamination which resulted in the establishment or expansion of common reed into areas where it was formerly absent. It should be noted that common reed is an invasive, non-native plant that is also associated with disturbed areas as this species can rapidly colonize areas of exposed soil or recently deposited fill material within or adjacent to wetlands. However, its presence within wetland areas that appear physically undisturbed (i.e., areas of fill not present) may be indicative of significant metals contamination.

Several areas of common reed dominated wetland are associated with the Hudson Branch wetland. The approximate extent of each of these areas is depicted on Figure 4-1. The areas dominated by common reed are limited to areas within the upstream portions of the Hudson Branch. These areas include emergent wetlands comprised nearly entirely of common reed as well as areas that contain a forested overstory (generally comprised of red maple) with a very dense common reed understory. These areas are generally associated with the greatest mass of metals (e.g., chromium, nickel and vanadium) in the Hudson Branch wetland surface soil.

4.4 Terrestrial Wildlife Receptors

Risks to the insectivorous/invertivorous short-tailed shrew and American robin from the mean detected concentrations of chromium and/or vanadium in the surface soils of the eastern storage areas and Hudson Branch wetlands that may be transferred to their food (i.e., terrestrial invertebrates) were identified in the Revised SLERA (TRC, 2011). Terrestrial invertebrate tissue samples were collected as a component of the BERA to assess the bioconcentration of chromium and vanadium into invertebrates that may be subsequently consumed by the assessment endpoints (insectivorous birds and mammals). It should be noted that the ingestion of surface soil was not included in the estimated exposure dose since the collected earthworm samples were not depurated and ingestion of these earthworms would also result in the ingestion of surface soil within their digestive tract. Estimated exposure doses to the shrew and robin were calculated based on exposure factors presented in Table 4-15.

4.4.1 Eastern Storage Areas Exposure

The Revised SLERA identified chromium and vanadium as COPECs that may present a risk to foraging mammalian and avian insectivores/invertivores foraging within the eastern storage areas. The median terrestrial invertebrate:surface soil BAFs calculated for these COPECs at the eastern storage areas were discussed in Section 3.2.3 and presented in Table 3-3. Estimated mean and the UCL of the mean concentrations of chromium and vanadium within terrestrial invertebrates were calculated using these BAFs and the mean and the UCL of the mean COPEC surface soil concentrations. Estimated exposure doses for the short-tailed shrew and American robin based on the mean UCL and the mean surface soil concentrations at the eastern storage areas are presented in Tables 4-16.

4.4.2 Hudson Branch Wetlands Exposure

The Revised SLERA identified chromium and/or vanadium as COPECs that may present a risk to foraging mammalian and/or avian insectivores. Specifically, surface soil concentrations of chromium may present a risk to both the short-tailed shrew and American robin while only the robin was potentially at risk from the detected surface soil concentrations of vanadium. The specific terrestrial invertebrate:surface soil BAFs calculated for chromium and vanadium in the Hudson Branch wetlands were discussed in Section 3.2.3 and were found to be highly correlated. Estimated mean and the UCL of the mean concentrations of COPECs within terrestrial invertebrates were calculated using the slope of the linear regression lines as the BAFs and the mean and the UCL of the mean chromium and vanadium surface soil concentrations. Estimated exposure doses for the short-tailed shrew and American robin based on the mean UCL and the mean surface soil concentrations are presented in Tables 4-17.

4.4.3 Risk Characterization

The estimated mean UCL and mean exposure doses ingested by the insectivorous terrestrial receptor species were compared to avian and mammalian MATC TRVs. The avian and mammalian MATC TRVs were presented in Table 4-13.

Table 4-18 presents estimated risks to the insectivorous short-tailed shrew and American robin from the mean UCL and mean COPEC concentrations in the surface soils of the eastern storage areas and Hudson Branch wetlands. Results for each of these two areas are discussed below.

4.4.3.1 Eastern Storage Areas

The mean UCL HIs are 12 and 46, respectively, for the shrew and robin while the mean HIs are 6 and 23, respectively. Mean surface soil concentrations of chromium and vanadium result in HQs of 2 and 4 for the shrew while robin HQs for mean chromium and vanadium concentrations are 4 and 19, respectively. Chromium and vanadium present a potential risk to foraging mammalian and avian insectivores within the eastern storage areas.

4.4.3.2 Hudson Branch Wetland

HQs for the short-tailed shrew from mean UCL and mean chromium concentrations in the Hudson Branch wetland surface soil samples are 7 for the mean UCL exposure dose and 3 for the mean exposure dose. The mean exposure dose of chromium ingested by the shrew (30.2 mg/kg-BW/day) is less than the LOAEL TRV of 58.2. Therefore, chromium presents a slight risk to foraging mammalian insectivores within the Hudson Branch wetlands.

The HIs for the insectivorous American robin from mean UCL and mean Hudson Branch wetland surface soil concentrations are 63 under the mean UCL exposure dose and 20 under the mean exposure dose with risk driven primarily by vanadium (mean HQ = 16). An HQ greater than unity was also calculated for mean estimated dose of chromium (HQ = 4). In addition, the mean estimated exposure doses for chromium and vanadium each exceed their respective LOAEL TRV. Overall, a potential risk exists to terrestrial avian insectivores foraging at the Hudson Branch wetland from the mean concentrations of vanadium and chromium detected in the surface soil. However, it should be noted that terrestrial invertivores present within the Hudson Branch wetland are assumed to forage only within the wetland and not within the adjacent upland habitat. For many areas within the downstream portions of the Hudson Branch wetland, the wetlands are fairly narrow and it would be unlikely that avian and mammalian invertivores would limit their foraging to wetland areas where chromium/vanadium contamination is most prevalent.

4.5 Uncertainty

There are considerable uncertainties associated with estimates of risk, as the risk estimates are based on a number of assumptions regarding exposure and toxicity. There is uncertainty associated with the site conceptual model, with natural variation and parameter error, and with model error (USEPA, 1997). A thorough understanding of the uncertainties associated with risk estimates is critical to understanding predicted risks and placing them in proper perspective.

Uncertainty associated with the conceptual model (Figure 2-8) includes assumptions about the sources of contaminants and the fate and transport of the contaminants at the SMC Facility. There is some uncertainty in the selection of the receptors as representative of communities utilizing the terrestrial and aquatic habitats at or in the vicinity of the SMC Facility. Habitat quality for some of the receptor species appears marginal within portions of the SMC Facility and will influence actual presence or exposure of species or communities within the different portions of the exposure areas. Habitat degradation primarily includes changes in plant community structure/diversity associated with the stands of non-native common reed. This degradation could be attributable to a number of factors, including sedimentation and other anthropogenic effects (potentially related to site activity or other activities within or adjacent to the Hudson Branch such as stormwater runoff from roadways or other developed areas). However, the BERA was conservative in assuming that exposure throughout the SMC Facility was possible regardless of existing habitat quality.

A significant fishery is currently not present within the Hudson Branch or Burnt Mill Pond. However, if Burnt Mill Pond water levels are returned to “normal” levels, there is a possibility that a fishery habitat could re-establish. The four surface water samples collected from Burnt Mill Pond during this study indicate that vanadium was the only COPEC detected in Burnt Mill Pond surface water samples above chronic water quality criteria/secondary chronic values and background considerations. Vanadium is not considered to be a bioaccumulative compound of concern. Therefore, based on these factors, the inclusion of a fish ingestion exposure pathway is unlikely to result in changes to the overall conclusions regarding ecological risks at the Site.

4.5.1 Exposure Estimation

Exposure estimates for indicator species are a source of uncertainty in the BERA. Values for exposure parameters (*e.g.*, body weight, food intake rate, sediment ingestion rate) were based on literature values, not site-specific data. The estimation of contaminant body burdens in terrestrial invertebrates was based on soil regression equations developed for earthworms that are in far greater contact with surface soil than would be the prey items (e.g., insects) that are also ingested by insectivorous species such as American robins or short-tailed shrews. However, the approach maintained in the BERA was to utilize conservative exposure parameters while maintaining a realistic evaluation of the potential for risk.

The bioaccumulative potential of plants varies among species, and even within different parts of the plant. Therefore, there are additional uncertainties in assuming tissue concentrations from whole plants are representative of the exposure of a consumer, particularly for a species that might selectively graze on a specific species or part of a plant.

In general, there is confidence that data collected for the BERA represent the types and distributions of sediment and surface water contaminants within the aquatic habitats present at or in the vicinity of the Site. However, for surface soils present within the eastern storage areas and southern area, the surface soil dataset used for the analysis includes areas of soil that area currently underneath the vegetated cap that was installed in 1999 and 2000 as part of the Natural Resource Restoration Areas to provide wildlife habitat value. In addition, receptors present within the Hudson Branch wetland are assumed to forage only within the wetland and not within the adjacent upland habitat. For many areas within the downstream portions of the Hudson

Branch wetland, the wetlands are fairly narrow and it would be unlikely that avian and mammalian invertivores would limit their foraging to wetland areas where chromium/vanadium contamination is most prevalent.

4.5.2 Toxicological Data

Toxicity values for indicator species and communities were based on literature values. This is a major source of uncertainty in the BERA. The sensitivity of receptors in the exposure areas associated with the Site may be different than the sensitivity of species used in tests reported in the literature. For vanadium, almost all of the avian studies were conducted on the domestic chicken (70 of the 72 total reproduction/growth endpoint studies). The only two studies that did not test responses of chickens involved Japanese quail (*Coturnix japonica*). The studies involving Japanese quail reported much greater NOAEL results on growth and reproduction than the tests involving the domestic chicken (generally an order of magnitude or greater than results reported for the chicken) which may indicate that the chicken is a very sensitive test organism for vanadium compared to other avian species.

Vanadium was detected at high concentrations in sediment samples collected in the Hudson Branch adjacent to and downgradient of the SMC Facility. It is possible that elevated levels of vanadium may adversely affect benthic organisms. Currently, there is not a sediment benchmark available for vanadium that can be used to evaluate potential risk to benthic invertebrates. Therefore, there is uncertainty associated with the potential risk to these receptors from the detected concentrations of vanadium within the sediments of the Hudson Branch. Surface water concentrations of vanadium exceed its Tier II secondary chronic value at 8 of 13 sampling locations within the Hudson Branch. However, five additional vanadium surface water TRVs were not exceeded at any of the sampling locations. Although adverse chronic effects to sensitive components of the aquatic biota inhabiting the Hudson Branch may occur from detected concentrations of vanadium, the risk is uncertain as other TRVs including the lowest chronic values for daphnids and fish (Suter, 1996) were not exceeded at any sample location.

An uncertainty associated with evaluating effects to terrestrial plants is the lack of effect concentrations from COPECs to vegetation. In particular, chromium was detected at high concentrations within surface soil samples collected from several of the terrestrial habitats evaluated. A plant TRV associated with trivalent (or total) chromium is not available. The effects of the elevated chromium concentrations on the terrestrial/wetland plant communities are uncertain.

Assumptions about the equality of contaminant form between laboratory tests and site field conditions must also be made in the absence of speciation analyses. This is a source of uncertainty, since toxicity may vary with the form of the toxicant in the environment. Thus, the actual toxicities of COPECs evaluated in this BERA could be higher or lower than indicated by the TRVs used in the development of HQs. One of the largest sources of uncertainty in all of these TRV values is the form of the chemical used to determine the laboratory exposure. The HQ approach uses the assumption that the absorption of the chemical from the diet will be the same as the absorption of the chemical in the form used in the laboratory. Often this assumption is very conservative, because absorption of metals ingested with sediment or plant material, is greatly reduced from forms given in laboratory studies.

5.0 SUMMARY AND PRELIMINARY REMEDIATION GOALS

5.1 BERA Summary

The portions of the Site evaluated in the BERA include aquatic habitats provided by the Hudson Branch and its associated wetland habitat and Burnt Mill Pond, as well as terrestrial habitats on the Facility (namely, the eastern storage areas, the southern area) and the wetland habitat associated with the Hudson Branch. A summary of calculated risks to the various receptors within the aquatic and terrestrial habitats identified at the Site is presented in Table 5-1 and discussed in the subsections below.

5.1.1 Sediment

The risk for sediments COPECs to impact aquatic invertebrates as well as semi-aquatic herbivores/insectivores are discussed in the subsections below.

5.1.1.1 Sediment – Aquatic Invertebrates

A total of 38 sediment COPECs (14 PAHs, 4 pesticides, 3 PCB Aroclors, and 17 inorganics) were initially identified for Hudson Branch and Burnt Mill Pond sediments because they were detected above their lowest aquatic invertebrate TRV at 1 or more of the 39 sediment samples collected. The concentrations of the four pesticides and six inorganics were detected at statistically similar concentrations as the reference sediment samples collected from the reference (background) stream, namely Burnt Mill Branch, so these constituents were not retained as COPECs. Two additional inorganics (magnesium and potassium) are essential nutrients and are unlikely to adversely affect benthic macroinvertebrates and were eliminated as COPECs. Although PAHs and PCB Aroclors exceed their threshold effect TRV in approximately one-third of the sediment samples, no sample detected any of these COPECs at a concentration above their respective probable effect TRV so PAHs and PCBs were not retained as COPECs. Similarly, concentrations of arsenic, cadmium and zinc exceed their threshold effect TRV but were only detected at a concentration above their respective probable effect TRV in one or fewer samples indicating significant impacts to the benthic macroinvertebrate community inhabiting the Hudson Branch/Burnt Mill Pond. Therefore, these constituents were also eliminated as COPECs.

Concentrations of the remaining six metals (antimony, chromium, copper, lead, nickel and vanadium) were frequently (i.e., 10 to 77 percent) detected above their probable effect TRV and/or detected above reference area concentrations (TRVs for vanadium are unavailable but this metal significantly exceeds the reference area concentrations). Chromium and nickel were both detected at concentrations above their probable effect TRV in greater than one-half of the sediment samples. These six metals were retained as sediment COPECs.

To better study the ecological impacts from the six metals, chronic 42-day exposure by *Hyalella azteca* via toxicity testing of six sediment samples collected from the Hudson Branch and two sediment samples within the Burnt Mill Branch (reference area) was conducted as a component of this BERA. Chronic endpoints included survival, growth, and reproduction.

Greatly reduced survival and reproduction were noted in the results from one location, namely SD-18. SD-18 is located in the Hudson Branch between the Facility and the Farm Parcel (south of Weymouth Road) within or adjacent to a monostand of the metal-tolerant common reed. Although a lower reproduction result was observed at SD-04 (downstream of SD-18 approximately 700 feet, within the Farm Parcel) that was statistically significant from the control sample, the result was not statistically significant with a reference area sample collected from the Burnt Mill Branch. Overall, the toxicity test results from SD-18 are indicative of potentially significant impacts to benthic macroinvertebrates due to very high mortality and no reproduction of surviving females. Sediment COPECs detected at elevated concentrations above their PEC TRVs at SD-18 included chromium (2,580 mg/kg) and nickel (158 mg/kg). Although a TRV is unavailable for vanadium, the concentration detected at SD-18 (595 mg/kg) is substantially greater than reference area concentrations of this COPEC. Two of the other Hudson Branch sediment samples (SD-13 and SD-15) tested for toxicity to *H. azteca* contained higher chromium and nickel concentrations than detected at SD-18 yet no adverse effects were noted on *H. azteca*.

Overall, the detected levels of chromium, nickel and/or vanadium within sediments of the Hudson Branch (including portions of Burnt Mill Pond) adjacent to or downgradient of the SMC facility substantially exceed their respective PEC TRVs and/or reference area concentrations indicating components of the aquatic macrobenthic community within portions of this aquatic habitat may potentially be adversely affected by high concentrations of these COPECs. Preliminary Remediation Goals for these compounds in sediment are calculated, as discussed in Section 5.2.

5.1.1.2 Sediment – Semi-Aquatic Herbivores/Insectivores

The collection of co-located sediment and aquatic plant and invertebrate samples was conducted at the Site in order to develop Site-specific bioaccumulation factors for the six COPECs identified for the Hudson Branch sediments (antimony, barium, chromium, copper, mercury and vanadium). These bioaccumulation factors were then used to estimate exposure doses to herbivorous/insectivorous avian/mammalian receptor species using the mean UCL and mean sediment concentrations. The estimated exposure doses were compared to MATC TRVs. This comparison indicates that HQs equal or greater than 1 are present from the mean sediment concentrations of chromium to foraging avian and mammalian herbivores while mean concentrations of chromium and vanadium present a risk to foraging avian/mammalian insectivores. HQs are less than one for antimony, barium, copper, and mercury, indicating that elevated risk is not calculated for these COPECs.

PRGs for chromium and vanadium in sediments are discussed in Section 5.2.

5.1.2 Surface Water

Benchmark screening resulted in the selection of six COPECs (aluminum, chromium, copper, iron, manganese and vanadium) in 13 surface water samples collected in 2011 from the Hudson Branch and Burnt Mill Pond. A comparison with reference area surface water concentrations concluded that aluminum and manganese concentrations are not significantly different between the Hudson Branch and the reference area (Burnt Mill Branch), so aluminum and manganese are not retained as COPECs. Copper, chromium and iron were detected in 1 or 2 samples of 13 samples, above their chronic water quality criteria (USEPA, 2009) while copper also exceeded its acute water quality criterion at one sample. These elevated concentrations were confined to samples collected in the upper portion of the Hudson Branch at the Site. Elevated concentrations above chronic and acute water quality criteria did not extend to downstream portions of the Hudson Branch off-Site. Therefore, these constituents are not anticipated to provide significant risk within the Hudson Branch.

Vanadium was detected above its Tier II secondary chronic value in 8 of 13 samples. Although adverse chronic effects to aquatic biota inhabiting the Hudson Branch may occur from detected concentrations of vanadium, the risk is uncertain as other TRVs including other chronic values were not exceeded at any surface water sampling location. Vanadium concentrations remain fairly consistent within the Hudson Branch from the Site downstream to its discharge into Burnt Mill Pond. Concentrations of vanadium in surface water samples collected from the upper portions of Burnt Mill Pond (i.e., in vicinity of Hudson Branch discharge to the pond) are elevated above its Tier II secondary chronic value while surface water samples collected from downstream portions of Burnt Mill Pond or near the discharge from the Burnt Mill Branch are below this benchmark. No other inorganics were detected in Burnt Mill Pond surface water samples greater than their TRVs or background surface water concentrations.

Overall, vanadium concentrations within Hudson Branch surface water may present a chronic risk to aquatic biota, however, the risk potential is uncertain as the detected concentrations are less than other chronic effect levels associated with impacts to daphnids and fish.

A surface water PRG for vanadium is not proposed for the Hudson Branch. However, it is anticipated that the remediation of vanadium within the sediments of the Hudson Branch (Section 5.2) would also result in a reduction of vanadium within the overlying surface water as Hudson Branch sediment represents a likely source for the vanadium concentrations noted in the surface water samples collected from the Hudson Branch.

5.1.3 Surface Soil – Plant Community

The risk for surface soils from the perspective of plant community and terrestrial insectivores are discussed in the subsections below.

5.1.3.1 Surface Soil – Plant Community

Risk to the terrestrial/wetland plant communities from COPECs that exceed their respective plant TRVs greater than approximately 20 percent of the samples within specific areas of the Facility (namely, the surface soil of the eastern storage areas, southern area) and Hudson Branch wetlands were previously identified in the Revised SLERA (TRC, 2011). Manganese, nickel and vanadium concentrations within the eastern storage areas, vanadium within the southern area, and nickel and vanadium in the Hudson Branch wetland may potentially result in impacts to the plant community. In addition, risks to vegetation from elevated concentrations of chromium within these areas may present a risk to terrestrial plants, however, a plant TRV for evaluating this COPEC is unavailable. As indicated previously, the dataset for the analysis includes many soil samples located underneath the vegetated cap that was installed in 1999 and 2000 as part of the Natural Resource Restoration Areas to provide wildlife habitat value.

Further evaluation, via a site inspection, of terrestrial/wetland plant communities considered evidence of stressed or dead vegetation as well as the presence of metals-tolerant species such as common reed (*Phragmites australis*) that may be indicative of metal phytotoxicity to other plants that were formerly present at greater densities. The vegetated cap of the eastern storage areas and southern area exhibited apparently healthy vegetation. Due to the absence of phytotoxicity effects and the presence of planted species that are continuing to provide wildlife habitat within the eastern storage areas and southern area, risks to the terrestrial plant communities within these areas were concluded to be low. The vegetated caps were established by importing soil (generally a minimum of 1 foot thick, but as much as 2 feet thick), then establishing vegetation on this soil. Species planted include pitch pine (*Pinus rigida*), chestnut oak (*Quercus prinus*), red oak (*Quercus rubra*), and persimmon (*Diospyros birginiana*). Vegetation currently present within these areas includes a variety of herbaceous plants and shrubs that assist in maintaining the integrity of the cap. In addition to providing natural resource value, these areas were intended as a cap to address potential soil contamination at these locations. To ensure these areas are maintained as vegetated areas, the future use of the planted areas is considered restricted. As such, the nature of these areas cannot be changed, without significant regulatory changes and major disruption to the flora and fauna.

Although direct evidence of phytotoxic effects (i.e. stressed vegetation) within the Hudson Branch wetland were not observed, the presence of wetland areas dominated by the metal-tolerant common reed plant may indicate that the plant community has previously been impacted by metals contamination which resulted in the establishment or expansion of common reed into areas where it was formerly absent. Several areas of common reed dominated wetland are associated with the upstream portions (from the Farm Parcel upgradient to the Facility) of the Hudson Branch wetland. These areas are generally associated with the greatest concentrations of metals (e.g., chromium, nickel and vanadium) in the Hudson Branch wetland surface soil.

Preliminary Remediation Goals for these compounds in soils are calculated, as discussed in Section 5.2.

5.1.3.2 Surface Soil – Terrestrial Insectivores

The collection of co-located surface soil and terrestrial invertebrate samples was conducted at the Site in order to develop Site-specific bioaccumulation factors for the COPECs identified for the eastern storage areas and Hudson Branch wetland (chromium and vanadium). These bioaccumulation factors were then used to estimate exposure doses to insectivorous avian/ mammalian receptor species (i.e., shrew and robin) using the mean UCL and mean surface soil concentrations. The estimated exposure doses were compared to MATC TRVs.

Mean surface soil concentrations of chromium and vanadium at the eastern storage areas result in HQs of 2 and 4 for the shrew while robin HQs for mean chromium and vanadium concentrations are 4 and 19, respectively. Therefore, chromium and vanadium present a potential risk to foraging mammalian and avian insectivores within the eastern storage areas.

For the Hudson Branch wetland, the HQ for the shrew from mean chromium concentrations in the Hudson Branch wetland surface soil samples is 3. Therefore, chromium presents a potential risk to foraging mammalian insectivores within the Hudson Branch wetlands. HQs for the insectivorous robin from mean Hudson Branch wetland surface soil concentrations are 16 for vanadium and 4 for chromium. Overall, a potential risk exists to terrestrial avian insectivores foraging at the Hudson Branch wetland from the mean concentrations of vanadium and chromium detected in the surface soil.

Preliminary Remediation Goals for chromium and vanadium are calculated, as discussed in Section 5.2.

5.2 Preliminary Remediation Goals

Based on the results of the BERA, Preliminary Remediation Goals (PRGs) were developed for the media of specific site areas where a potential ecological risk was identified, namely:

- Sediments associated with the Hudson Branch and Burnt Mill Pond;
- Surface soil at the eastern storage areas; and,
- Surface soils associated with the Hudson Branch wetland.

For each of these media, potential PRGs are first calculated for the various affected ecological populations. Then, a proposed PRG is selected, based on scientific factors such as the strength and certainty of the analysis results.

5.2.1 Sediments

Potential PRGs were developed for the following ecological populations:

- aquatic invertebrates; and,

- semi-aquatic wildlife.

The semi-aquatic wildlife community includes avian and mammalian herbivores, and avian and mammalian insectivores that may inhabit and/or forage within the aquatic habitats provided by the Hudson Branch. For the benthic aquatic macroinvertebrate community, potential PRGs are based on the results of the laboratory toxicity testing for the sediment samples collected within the Hudson Branch. Potential PRGs for the semi-aquatic wildlife receptors foraging on plants or aquatic macroinvertebrates residing in the sediments are based on the use of an HQ of 1 for the selected MATC and LOAEL avian/mammalian TRVs.

5.2.1.1 Aquatic Invertebrate Potential PRGs

The results of the toxicity testing found significantly reduced survival of *Hyalella azteca* (nearly 99% mortality) at SD-18 while SD-04 had reduced reproduction of *H. azteca* compared to the laboratory control but the reduced reproduction was not significantly different than the reference samples. No adverse effects were noted in the growth rates in any of the samples or for survival/ reproduction in the sediment samples collected at the remaining four Hudson Branch locations or the two reference samples collected from the Burnt Mill Branch. Concentrations of COPECs identified as potential risk drivers within the Hudson Branch at the sediment toxicity test samples are presented in Table 5-2 along with the toxicity test results and the probable effect TRV reported in the literature where toxic effects are likely to occur to benthic organisms.

LOAELs were identified for each COPEC based on its concentration at sediment sample SD-18 where toxic effects were noted to *H. azteca*. However, for those COPECs that were not detected above their probable effect TRV at SD-18, a LOAEL was not selected since toxicity is considered to be associated with the COPECs that contain elevated sediment concentrations above their probable effect TRVs. A NOAEL was then selected for all COPECs based on the highest detected concentration below the LOAEL value where toxicity did not result to the test organism. For those COPECs where a LOAEL was not selected, the highest detected concentration represents the NOAEL. Based on the toxicity test results and sediment chemistry results presented in Table 5-2, the potential PRGs for benthic macroinvertebrates would be as follows:

- chromium (1,275 mg/kg – geomean of highest NOAEL and LOAEL);
- vanadium (574 mg/kg – geomean of highest NOAEL and LOAEL);
- copper (222 mg/kg – highest NOAEL);
- lead (303 mg/kg – highest NOAEL); and,
- nickel (107 mg/kg – geomean of highest NOAEL and LOAEL).

As discussed in Section 4.1.2.3, previous sediment toxicity testing was conducted in 2009 for four Hudson Branch sediment samples and a reference sample collected from the Burnt Mill Branch. No significant results were noted between any of the five sediment samples and the control sediment on *H. azteca* survival or growth exposed to sediment for 10 days. The chromium and nickel concentrations in the 2009 sediment toxicity test samples collected from the Hudson Branch (see Table 9A) exceed the potential PRGs in three of the four sediment samples. As adverse effects were not identified in these sediment samples, the potential PRGs would appear to represent conservative thresholds for impacts to benthic macroinvertebrates.

5.2.1.2 Semi-Aquatic Wildlife Receptor Potential PRGs

Establishment of potential PRGs for the receptors at risk (avian/mammalian herbivores and insectivores) was conducted based on identifying receptor-specific "safe" concentrations of COPECs. For the wildlife indicator species, potential PRGs for chromium and vanadium in sediment were calculated based on the use of an HQ of 1 for the selected MATC avian/mammalian TRVs. The estimated exposure dose (ED) of chromium and vanadium ingested by each of the wildlife indicator species is the dose that will result in an HQ of 1 (i.e., the wildlife indicator species ED equals the avian or mammalian MATC TRV). This process was repeated to then develop a potential PRG based on the LOAEL avian/mammalian TRVs. The LOAEL potential PRG would represent a less conservative potential PRG for evaluating remediation benefits to wildlife receptors inhabiting the study area.

For avian and mammalian herbivores, the chromium potential PRGs were determined by substituting sediment concentrations into Table 4-11 until the exposure dose is equal to the

MATC TRV. This process was then repeated until the estimated exposure dose was equal to the LOAEL TRV. Each trial-and-error attempt calculates a plant tissue concentration using the site-specific chromium BAF for vegetation:sediment and the resulting exposure dose based on this tissue concentration. The resulting chromium sediment potential PRGs for muskrat and mallard are:

- Chromium MATC potential PRGs are 1,250 mg/kg and 578 mg/kg for the muskrat and mallard, respectively.

- Chromium LOAEL potential PRGs are 6,190 mg/kg and 1,400 mg/kg for the muskrat and mallard, respectively.

Chromium and vanadium potential PRGs were also determined for avian and mammalian insectivores by substituting sediment concentrations into Table 4-12 until the exposure doses are equal to the MATC and LOAEL TRV. Each trial-and-error attempt calculates an aquatic tissue concentration using the site-specific chromium and vanadium BAFs for aquatic invertebrates: sediment and the resulting exposure doses based on these tissue concentrations. The estimated exposure doses for the little brown bat and tree swallow that equal their respective MATC and LOAEL TRVs are as follows:

- chromium sediment MATC potential PRGs for the little brown bat and tree swallow are 1,200 mg/kg and 254 mg/kg, respectively;

- chromium sediment LOAEL potential PRGs for the little brown bat and tree swallow are 5,930 mg/kg and 616 mg/kg, respectively;

- Vanadium sediment MATC potential PRGs for the little brown bat and tree swallow are 80.3 mg/kg and 5.86 mg/kg, respectively; and,

- Vanadium sediment LOAEL potential PRGs for the little brown bat and tree swallow are 102 mg/kg and 7.10 mg/kg, respectively.

5.2.1.3 Proposed Sediment PRGs

A summary of the potential PRGs for the study area sediment is presented in Table 5-3.

The greatest degree of strength and certainty is believed to be represented by the benthic macroinvertebrate toxicity testing analysis. For this reason, the potential PRGs based on the toxicity testing results (i.e., benthic macroinvertebrate potential PRGs) were selected as the proposed PRGs as follows:

- <u>Chromium: 1,275 mg/kg;</u>

- <u>Copper: 223 mg/kg;</u>

- <u>Lead: 203 mg/kg;</u>

- <u>Nickel: 107 mg/kg; and,</u>

- Vanadium: 574 mg/kg.

Poor data correlation for the tissue sampling introduces unwanted uncertainty into the other potential PRGs. However, remediating sediments at concentrations at and above the proposed benthic community PRGs are expected to also benefit both avian/mammalian herbivores and insectivores.

Figure 5-1 presents a cumulative distribution of the chromium concentrations within the Hudson Branch sediment along with the proposed PRG for benthic macroinvertebrates and the MATC and LOAEL potential PRGs for the muskrat, mallard, little brown bat and tree swallow. As depicted on Figure 5-1, the remediation of chromium sediment concentrations to the proposed PRG of 1,275 mg/kg chromium will result in the removal of the vast majority of the chromium within the Hudson Branch. The remaining concentrations of chromium will also be less than the muskrat and little brown bat MATC and LOAEL potential PRGs as well as the mallard LOAEL potential PRG.

Copper, lead and nickel cumulative sediment concentrations and the benthic macroinvertebrate proposed PRG and aquatic invertebrate TEC and PEC TRVs are presented in Figures 5-2 through 5-4, respectively. The proposed copper, lead and nickel PRGs will result in approximately 20 (lead) to 85 percent (nickel) of these COPECs within the Hudson Branch. However, the percentage of removal, particularly for lead, would be substantially increased as the area of proposed chromium remediation includes additional areas where these COPECs are present but at concentrations below their respective proposed PRGs.

Figure 5-5 presents a cumulative distribution of the vanadium concentrations within the Hudson Branch sediment along with the proposed PRGs for benthic macroinvertebrates and the MATC and LOAEL potential PRGs for the little brown bat and tree swallow. The remediation of vanadium sediment concentrations to 574 mg/kg will result in the removal of approximately 70 percent of the vanadium within the Hudson Branch. The areas of elevated vanadium concentrations above its proposed PRG are within the areas of elevated chromium sediment concentrations and remediation of chromium-contaminated sediment will result in additional vanadium removal.

5.2.1.4 Extent of COPECs above Proposed PRGs

Nearly 60 percent of the Hudson Branch and Burnt Mill Pond sediment samples did *not* detect COPECs at concentrations above the proposed PRGs. Exceedances of the proposed PRGs are aerially limited to Hudson Branch from the Facility downstream to the Farm Parcel. Proposed PRGs are not exceeded in Burnt Mill Pond. Figure 5-6 depicts all recent sediment sampling locations within the Hudson Branch/Burnt Mill Pond and indicates those samples where one or more COPEC was detected above its proposed PRG as well as samples where no COPEC exceeded its proposed PRG.

The chromium and nickel proposed PRGs were each exceeded at 14 samples of the 39 Hudson Branch (and Burnt Mill Pond) sediment samples. Copper and lead were detected at concentrations at or above their proposed PRGs at 7 and 3 samples, respectively (see Table B-3).

Vanadium exceeded its proposed PRG at 8 of 29 sediment samples where this COPEC was analyzed.

5.2.2 Hudson Branch Wetland

5.2.2.1 Proposed Surface Soil PRGs

Avian and mammalian insectivore potential PRGs for chromium and vanadium (robin only) were also calculated for the wetlands associated with the Hudson Branch by substituting surface soil concentrations into Table 4-17 until the exposure dose is equal to the MATC and LOAEL TRVs. Each trial-and-error attempt calculates a terrestrial invertebrate tissue concentration using the site-specific chromium and vanadium BAFs for terrestrial invertebrates: surface soil and the resulting exposure doses based on these tissue concentrations. The estimated exposure doses for the short-tailed shrew and American robin that equal their respective MATC and LOAEL TRVs are as follows:

- Chromium surface soil MATC potential PRGs for the short-tailed shrew and American robin are 261 mg/kg and 157 mg/kg, respectively;
- Chromium surface soil LOAEL potential PRGs for the short-tailed shrew and American robin are 1,290 mg/kg and 380 mg/kg, respectively;
- Vanadium surface soil MATC potential PRG for the American robin is 32 mg/kg; and,
- Vanadium surface soil LOAEL potential PRG for the American robin is 39 mg/kg.

Because each of the potential PRGs have somewhat equal strength in the analysis, the more conservative (lower) values could be selected for the proposed PRGs, as follows:

- Chromium wetland soil proposed PRG is 157 mg/kg; and,
- Vanadium wetland soil proposed PRG is 32 mg/kg.

As discussed in Section 3.2.3 of the BERA, the concentrations of chromium and vanadium in terrestrial invertebrates were strongly correlated with the surface soil concentrations of chromium and vanadium within the Hudson Branch wetland. A summary of the proposed PRGs for the surface soils of the Hudson Branch wetlands are presented in Table 5-4.

5.2.2.2 Extent of COPECs above Proposed PRGs

The extent of COPECs within Hudson Branch wetland surface soils above the proposed PRGs are shown in Figure 5-7. Chromium was detected at concentrations above its proposed PRG of 157 mg/kg in 25 of 70 (35 percent) Hudson Branch wetland surface soil samples while vanadium exceeds its PRG (32 mg/kg) at 49 of 70 (70 percent) surface soil samples. The areas where chromium and/or vanadium exceed their proposed PRGs is includes the wetlands present on the SMC Facility and wetlands located within 50 to 200 feet along the length of the Hudson Branch (nearly to Burnt Mill Pond).

As discussed in Section 4.3, portions of the Hudson Branch wetland plant community has potentially been impacted by metals contamination. The remediation of these degraded wetland habitats would also greatly reduce the risk to foraging avian and mammalian insectivores as these habitats generally contain the greatest chromium and vanadium concentrations detected within the surface soils of the Hudson Branch wetland. Although wetland surface soil concentrations of chromium and vanadium located outside the limits of these degraded wetlands would remain above the proposed PRGs, these wetlands are generally forested and currently provide quality wildlife habitat for many species including potentially the wood thrush, a New Jersey Special Concern Species (see Appendix C).

5.2.3 Eastern Storage Areas

5.2.3.1 Proposed Surface Soil PRGs

Potential PRGs for chromium and vanadium were determined for avian and mammalian insectivores foraging within the eastern storage areas by substituting surface soil concentrations into Table 4-16 until the exposure dose is equal to the MATC TRV. Each trial-and-error attempt calculates a terrestrial invertebrate tissue concentration using the site-specific chromium and vanadium bioaccumulation factors for terrestrial invertebrates:surface soil and the resulting exposure doses based on these tissue concentrations. This process was then repeated to determine the LOAEL potential PRGs for these receptors. The estimated exposure doses for the short-tailed shrew and American robin that equal their respective chromium MATC and LOAEL TRVs result in the following potential PRGs:

- Chromium surface soil MATC potential PRGs for the short-tailed shrew and American robin are 74 mg/kg and 44.4 mg/kg, respectively;
- Chromium surface soil LOAEL potential PRGs for the short-tailed shrew and American robin are 366 mg/kg and 108 mg/kg, respectively;
- Vanadium surface soil MATC potential PRG for the short-tailed shrew and American robin are 255 mg/kg and 52.5 mg/kg, respectively; and,
- Vanadium surface soil LOAEL potential PRG for the short-tailed shrew and American robin are 322 mg/kg and 63 mg/kg, respectively.

A summary of the proposed PRGs for the surface soils of the eastern storage areas are presented in Table 5-4. Because each of the potential PRGs have somewhat equal strength in the analysis, the more conservative (lower) values could be selected for the proposed PRGs, as follows:

- Chromium soil proposed PRG of 44.4 mg/kg; and,
- Vanadium soil proposed PRG of 52.5 mg/kg.

As discussed in Section 3.2.3 of the BERA, the concentrations of chromium and vanadium in terrestrial invertebrates were poorly correlated with the surface soil concentrations of chromium and vanadium. Therefore, significant uncertainty is present regarding the proposed surface soil PRGs for chromium and vanadium and their usefulness in reducing risk to avian and mammalian insectivores that may forage within the eastern storage areas.

5.2.3.2 Extent of COPECs above Proposed PRGs

Chromium was detected at concentrations above its proposed PRG at 20 of 29 surface soils samples collected from the eastern storage areas while vanadium exceeds its proposed PRG at 24 of 30 surface soil samples. As discussed previously, significant portions of the eastern storage area have received a vegetated cap providing upland vegetation and wildlife habitat. The potential benefit of any proposed surface soil remediation within these areas should be weighed against the alteration of wildlife habitat currently present.

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TABLES

Table 2-1
Selection of Contaminants of Potential Ecological Concern - Surface Water
SMC Superfund Site
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Ref.	Maximum Detected Concentration	Detection Frequency	Retained as COPEC?	COPEC Selection Rationale
VOCs (ug/L)	cis-1,2-Dichloroethene	590	c	0.57	14%	No	< Benchmark
Inorganics, Total							
(ug/L)	Aluminum	87	b	239	100%	Yes	> Benchmark
	Calcium	116,000	c	10,000	92%	No	< Benchmark
	Chromium	47	a	42	69%	No	< Benchmark
	Cobalt	24	a	7.7	100%	No	< Benchmark
	Copper	4.9	a	8.0	92%	Yes	> Benchmark
	Iron	1,000	b	3,460	100%	Yes	> Benchmark
	Lead	5.4	a	3.8	15%	No	< Benchmark
	Magnesium	82,000	c	10,080	31%	No	< Benchmark
	Manganese	120	c	1,160	100%	Yes	> Benchmark
	Nickel	28	a	24.6	15%	No	< Benchmark
	Potassium	53,000	c	10,650	8%	No	< Benchmark
	Sodium	680,000	c	94,350	85%	No	< Benchmark
	Vanadium	12	a	80	62%	Yes	> Benchmark
	Zinc	63	a	20	8%	No	< Benchmark
Inorganics, Dissolved							
(ug/L)	Aluminum	87	b	283	62%	Yes	> Benchmark
	Calcium	116,000	c	9,970	92%	No	< Benchmark
	Chromium	40	b	50	62%	Yes	> Benchmark
	Cobalt	24	a	7.1	100%	No	< Benchmark
	Copper	4.7	b	6.5	85%	Yes	> Benchmark
	Iron	1,000	b	2,770	100%	Yes	> Benchmark
	Magnesium	82,000	c	6,890	38%	No	< Benchmark
	Manganese	120	c	1,160	100%	Yes	> Benchmark
	Nickel	28	b	24	15%	No	< Benchmark
	Sodium	680000	c	96,600	85%	No	< Benchmark
	Vanadium	12	a	71	62%	Yes	> Benchmark

Table 2-1
Selection of Contaminants of Potential Ecological Concern - Surface Water
SMC Superfund Site
Newfield, New Jersey

Notes:

ug/L - micrograms per liter or parts per billion (ppb).

PCOPEC - Preliminary contaminant of potential ecological concern

* Surface Water Screening Benchmarks from following sources:

(a) NJDEP Ecological Screening Criteria for Fresh Water (NJDEP, 2009)

(b) National Recommended Water Quality Criteria (USEPA, 2009)

(c) EPA Region III BTAG Freshwater Screening Benchmarks (USEPA, 2006)

Table 2-2
Selection of Contaminants of Potential Ecological Concern - Sediment
SMC Superfund Site
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as COPEC?	COPEC Selection Rationale
SVOCs							
(ug/kg)	Acenaphthene	16 (a)	19.8	6%	Yes	Yes	Max. Detect > Benchmark
	Acenaphthylene	44 (a)	357	41%	Yes	Yes	Max. Detect > Benchmark
	Anthracene	220 (a)	262	41%	Yes	Yes	Max. Detect > Benchmark
	Benzo(a)anthracene	320 (a)	604	65%	Yes	Yes	Max. Detect > Benchmark
	Benzo(a)pyrene	370 (a)	674	53%	Yes	Yes	Max. Detect > Benchmark
	Benzo(b)fluoranthene	10,400 (a)	963	53%	Yes	No	Max. Detect < Benchmark
	Benzo(g,h,i)perylene	170 (a)	510	53%	Yes	Yes	Max. Detect > Benchmark
	Benzo(k)fluoranthene	240 (a)	346	53%	Yes	Yes	Max. Detect > Benchmark
	bis(2-ethylhexyl)phthalate	182 (a)	1250	76%	No	Yes	Max. Detect > Benchmark
	Carbazole	NA	81.5	18%	No	Yes	No Benchmark Available
	Chrysene	340 (a)	826	65%	Yes	Yes	Max. Detect > Benchmark
	Dibenzo(a,h)anthracene	60 (a)	123	35%	Yes	Yes	Max. Detect > Benchmark
	Di-n-octyl phthalate	40,600 (c)	197	6%	No	No	Max. Detect < Benchmark
	Dimethyl phthalate	NA	408	76%	No	Yes	No Benchmark Available
	Fluoranthene	750 (a)	1480	71%	Yes	Yes	Max. Detect > Benchmark
	Fluorene	190 (a)	58.5	18%	Yes	No	Max. Detect < Benchmark
	Indeno(1,2,3-cd)pyrene	200 (a)	438	53%	Yes	Yes	Max. Detect > Benchmark
	2-Methylnaphthalene	70 (a)	81.2	6%	Yes	Yes	Max. Detect > Benchmark
	Phenanthrene	560 (a)	698	53%	Yes	Yes	Max. Detect > Benchmark
	Pyrene	490 (a)	1270	76%	Yes	Yes	Max. Detect > Benchmark
Pesticides							
(ug/kg)	alpha-Chlordane	7.0 (a)	6.85	18%	Yes	No	Max. Detect < Benchmark
	gamma-Chlordane	7.0 (a)	5.8	6%	Yes	No	Max. Detect < Benchmark
	Dieldrin	2.0 (a)	5.05	24%	Yes	Yes	Max. Detect > Benchmark
	4,4'-DDD	8.0 (a)	29.6	59%	Yes	Yes	Max. Detect > Benchmark
	4,4'-DDE	5.0 (a)	10.65	65%	Yes	Yes	Max. Detect > Benchmark
	4,4'-DDT	8.0 (a)	10.7	41%	Yes	Yes	Max. Detect > Benchmark
PCBs							
(ug/kg)	Aroclor 1248	30 (a)	313	18%	Yes	Yes	Max. Detect > Benchmark
	Aroclor 1254	60 (a)	148.5	18%	Yes	Yes	Max. Detect > Benchmark

Table 2-2
Selection of Contaminants of Potential Ecological Concern - Sediment
SMC Superfund Site
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as COPEC?	COPEC Selection Rationale
	Aroclor 1260	5 (a)	256	24%	Yes	Yes	Max. Detect > Benchmark
Inorganics							
(mg/kg)	Aluminum	25,500 (a)	37,800	100%	No	Yes	Max. Detect > Benchmark
	Antimony	2 (b)	34.3	31%	No	Yes	Max. Detect > Benchmark
	Arsenic	9.98 (a)	34.7	73%	Yes	Yes	Max. Detect > Benchmark
	Barium	NA	394	90%	No	Yes	No Benchmark Available
	Beryllium	NA	10.65	41%	No	Yes	No Benchmark Available
	Cadmium	0.99 (a)	2.5	18%	Yes	Yes	Max. Detect > Benchmark
	Calcium	NA	3,110	61%	No	Yes	No Benchmark Available
	Chromium	43.4 (a)	10,200	97%	No	Yes	Max. Detect > Benchmark
	Cobalt	50 (a)	33.3	26%	No	No	Max. Detect < Benchmark
	Copper	31.6 (a)	247	92%	Yes	Yes	Max. Detect > Benchmark
	Iron	20,000 (b)	36,000	100%	No	Yes	Max. Detect > Benchmark
	Lead	35.8 (a)	317.5	97%	Yes	Yes	Max. Detect > Benchmark
	Magnesium	NA	2,360	30%	No	Yes	No Benchmark Available
	Manganese	630 (a)	507	100%	No	No	Max. Detect < Benchmark
	Mercury	0.174 (a)	2.5	95%	Yes	Yes	Max. Detect > Benchmark
	Nickel	22.7 (a)	1,140	92%	Yes	Yes	Max. Detect > Benchmark
	Potassium	NA	1,200	9%	No	Yes	No Benchmark Available
	Selenium	2 (b)	2	3%	Yes	No	Max. Detect < Benchmark
	Silver	0.5 (a)	0.615	4%	Yes	Yes	Max. Detect > Benchmark
	Vanadium	NA	3,280	97%	No	Yes	No Benchmark Available
	Zinc	121 (a)	525	100%	Yes	Yes	Max. Detect > Benchmark

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
ug/kg - micrograms per kilogram (dry weight) or parts per billion (ppb).
J - Estimated value.
PCOPEC - Preliminary contaminant of potential ecological concern
NA - No benchmark available for this compound.
PAHs - Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated Biphenyls.

* Sediment Screening Benchmarks from following sources:
(a) - NJDEP Ecological Screening Criteria, March 2009.
(b) - Freshwater Sediment Screening Benchmarks, USEPA Region III, August 2006b.
(c) - Sediment Ecological Screening Values, USEPA Region 5, August 2003.

[1] as listed by USEPA (2000)

Table 2-2
Selection of Contaminants of Potential Ecological Concern - Sediment
SMC Superfund Site
Newfield, New Jersey

	Analyte	Ecological Screening Benchmark*	Maximum Detected Concentration	Detection Frequency	Bioaccum-ulative Compound?[1]	Retained as COPEC?	COPEC Selection Rationale

SVOCs - Semivolatile Organic Compounds.

R2-0001558

Table 2-3
BERA - Assessment Endpoints and Measurement Endpoints
SMC Superfund Site
Newfield, New Jersey

Assessment Endpoints	Measurement Endpoints	Exposure Area
Aquatic Invertebrate Community Diversity and Abundance	Comparison of surface water PCOPEC concentrations with surface water thresholds associated with adverse effects to invertebrates. Comparison of bulk sediment PCOPEC concentrations with sediment thresholds and probable adverse effects to benthic biota. Evaluate results of sediment toxicity testing to *Hyalella azteca* test organism.	Hudson Branch
Mammalian Semi-Aquatic Herbivore Survival/Reproduction/Growth	Comparison of estimated chromium exposure dose received by muskrat to chronic MATC/LOAEL survival, reproductive, or growth effect concentrations reported in the literature.	Hudson Branch
Avian Semi-Aquatic Herbivore Survival/Reproduction/Growth	Comparison of estimated chromium exposure dose received by mallard to chronic MATC/LOAEL survival, reproductive, or growth effect concentrations reported in the literature.	Hudson Branch
Avian Semi-Aquatic Insectivore Survival/Reproduction/Growth	Comparison of estimated barium, copper, chromium, mercury and vanadium exposure doses received by tree swallow to chronic MATC/LOAEL survival, reproductive, or growth effect concentrations reported in the literature.	Hudson Branch
Mammalian Semi-Aquatic Insectivore Survival/Reproduction/Growth	Comparison of estimated antimony, chromium and vanadium exposure doses received by little brown bat to chronic MATC/LOAEL survival, reproductive, or growth effect concentrations reported in the literature.	Hudson Branch
Terrestrial Plant Community Survival/ Growth	Comparison of bulk surface soil PCOPEC concentrations with soil levels associated with potential adverse effects to vegetation and evaluation of plant communities for potential phytotoxic effects.	Eastern Storage Areas, Southern Area, Hudson Branch Wetlands
Avian Terrestrial Insectivore Survival/Reproduction/Growth	Comparison of estimated chromium and vanadium exposure doses received by American robin to chronic MATC/LOAEL survival, reproductive, or growth effect concentrations reported in the literature.	Eastern Storage Areas, Hudson Branch Wetlands
Mammalian Terrestrial Insectivore Survival/Reproduction/ Growth	Comparison of estimated chromium and vanadium exposure doses received by short-tailed shrew to chronic MATC/LOAEL survival, reproductive, or growth effect concentrations reported in the literature.	Eastern Storage Areas, Hudson Branch Wetlands

Table 3-1
Bioaccumulation Factor (BAF) for Sediment and Aquatic Vegetation Tissue Sampling Results
SMC Superfund Site
Newfield, New Jersey

Location/Sample	Plant Species	Portion(s) of Plant Sampled	Sediment Concentration (mg/kg)	Plant Concentration (mg/kg)	Bioaccumulation Factor (BAF)
Hudson Branch					
BERA-AV-01	*Carex sp.*	Leaves	150	18.9	0.126
BERA-AV-02	*Polygonum sp.*	Stems/Leaves/Seeds	473	268	0.567
BERA-AV-03	*Polygonum sp.*	Stems/Leaves/Seeds	6295	161	0.026
BERA-AV-04	*Polygonum sp.*	Stems/Leaves/Seeds	2820	136	0.048
BERA-AV-05	*Nasturtium sp.*	Leaves/Stems	3820	560	0.147
BERA-AV-06	*Polygonum sp.*	Stems/Leaves/Seeds	3470	61.4	0.018
BERA-AV-07	*Nasturtium sp.*	Leaves/Stems	424	194	0.458
BERA-AV-08	*Typha latifolia*	Tubers/Shoots	700	737	1.053
Median BAF					0.136
Burnt Mill Branch					
BERA-AV-09	*Nasturtium sp.*	Leaves/Stems	3.40	12.0	3.529
BERA-AV-10	*Polygonum sp.*	Stems/Leaves/Seeds	15.0	6.12	0.408

Notes

BAF calculated by dividing dry weight tissue concentration by dry weight sediment concentration.

Table 3-2
Bioaccumulation Factor (BAF) for Sediment and Aquatic Invertebrate Tissue Sampling Results
SMC Superfund Site
Newfield, New Jersey

Location/Sample	Invertebrate Species	Sediment Concentration (mg/kg)		Aquatic Invertebrate Concentration (mg/kg)		Bioaccumulation Factor (BAF)
Hudson Branch						
BERA-AI-01/SD-01						
Antimony	Anisoptera	2.2	U	0.786	UJ	-
Barium		62.3		16.6	J	0.266
Chromium		150		140.0	J	0.933
Copper		8.0		48.2	J	6.025
Mercury		0.075		0.196	UJ	-
Vanadium		84.3		68.2	J	0.809
BERA-AI-02/SD-10						
Antimony	Coleoptera, Anisoptera	3.05	J	0.050	UJ	-
Barium		35.05		2.98	J	0.085
Chromium		473	J	10.2	J	0.022
Copper		65.95		9.72	J	0.147
Mercury		0.13	J	0.036	J	0.277
Vanadium		203	J	12.9	J	0.064
BERA-AI-03/SD-13						
Antimony	Hemiptera, Coleoptera	8.5	U	0.067	UJ	-
Barium		394		1.25	J	0.0032
Chromium		6295		1.71	J	0.00027
Copper		222.5		4.34	J	0.0195
Mercury		2.05		0.037	J	0.0180
Vanadium		945		1.27	J	0.00134
BERA-AI-04/BERA-SD-4						
Antimony	Zygoptera, Anisoptera, Plecoptera, Coleoptera	19.4		0.556	UJ	-
Barium		204		26.4	J	0.129
Chromium		2820		67.1	J	0.024
Copper		247		56.4	J	0.228
Mercury		0.79		0.173	J	0.219
Vanadium		978		83.4	J	0.085
BERA-AI-05/BERA-SD-5						
Antimony	Zygoptera, Plecoptera	27.7		0.884	U	-
Barium		163		120		0.736
Chromium		3820		262		0.069
Copper		139.8		54.7		0.391
Mercury		1.785		0.469		0.263
Vanadium		543.5		656		1.207
BERA-AI-06/BERA-SD-6						
Antimony	Ephemeroptera, Plecoptera, Anisoptera, Coleoptera	7.0	U	0.833	U	-
Barium		298		19.8		0.066
Chromium		3470		81.6		0.024
Copper		141		33.2		0.235
Mercury		0.79		0.376		0.476
Vanadium		1450		24.2		0.017

Table 3-2
Bioaccumulation Factor (BAF) for Sediment and Aquatic Invertebrate Tissue Sampling Results
SMC Superfund Site
Newfield, New Jersey

Location/Sample	Invertebrate Species	Sediment Concentration (mg/kg)		Aquatic Invertebrate Concentration (mg/kg)		Bioaccumulation Factor (BAF)
BERA-AI-07/BERA-SD-7						
Antimony	Zygoptera, Anisoptera, Trichoptera, Ephemeroptera	4.1	U	1.01	U	-
Barium		101		112		1.109
Chromium		424		291		0.686
Copper		19.9		74.8		3.759
Mercury		0.098		0.416		4.245
Vanadium		167		131		0.784
BERA-AI-08/BERA-SD-8						
Antimony	Anisoptera	4.5	U	0.724	U	-
Barium		92.5		71.6		0.774
Chromium		700		519		0.741
Copper		20.1		51.0		2.537
Mercury		0.11		0.181	U	-
Vanadium		107		93.5		0.874
Median BAFs						
Antimony		-		-		0.000
Barium		-		-		0.198
Chromium		-		-		0.046
Copper		-		-		0.313
Mercury		-		-		0.270
Vanadium		-		-		0.435
Burnt Mill Branch						
BERA-AI-09/SD-31						
Antimony	Zygoptera, Anisoptera, Plecoptera, Megaloptera	2.00	UJ	0.050	U	-
Barium		107	J	5.46		0.051
Chromium		3.40	J	1.28		0.376
Copper		3.60	J	2.41		0.669
Mercury		0.27	J	0.147		0.544
Vanadium		5.40	J	0.580		0.107
BERA-AI-10/SD-35						
Antimony	Zygoptera, Anisoptera, Plecoptera, Coleoptera	9.9	U	0.324	U	-
Barium		112		10.8		0.096
Chromium		15.0		5.49		0.366
Copper		14.2		26.9		1.894
Mercury		0.67		1.26		1.881
Vanadium		25.0	U	3.24	U	0.130

Notes

J - Estimated value

U - Compound was not detected at specified quantitation limit

UJ - Estimated non-detect

BAF calculated by dividing dry weight tissue concentration by dry weight sediment concentration.

Table 3-3
Bioaccumulation Factor (BAF) for Surface Soil and Terrestrial Invertebrate Tissue Sampling Results
SMC Superfund Site
Newfield, New Jersey

Location/Sample	Invertebrate Species	Surface Soil Concentration (mg/kg)	Terrestrial Invertebrate Concentration (mg/kg)	Bioaccumulation Factor (BAF)
Hudson Branch Wetland				
BERA-TI-01/BERA-SS-01				
Chromium	Earthworms	34.0	40.8 J	1.200
Vanadium		138	42.3 J	0.307
BERA-TI-02/BERA-SS-02				
Chromium	Earthworms	2310	829 J	0.359
Vanadium		481	168 J	0.349
BERA-TI-03/BERA-SS-03				
Chromium	Earthworms	22.0	37.8 J	1.718
Vanadium		60.0	61.3 J	1.022
BERA-TI-05/BERA-SS-05				
Chromium	Earthworms	6.00	7.13	1.188
Vanadium		16.3	6.32 U	-
BERA-TI-07/BERA-SS-07				
Chromium	Earthworms	357	130	0.364
Vanadium		354	90.6	0.256
BERA-TI-08/BERA-SS-08				
Chromium	Earthworms	87.7	124	1.414
Vanadium		131	84.8	0.647
Eastern Storage Areas				
BERA-TI-09/BERA-SS-09				
Chromium	Earthworms, Grubs	132	38.9	0.295
Vanadium		286	29.8	0.104
BERA-TI-10/BERA-SS-10				
Chromium	Earthworms, Grubs	30.3	63.3	2.089
Vanadium		60.6	43.6	0.719
BERA-TI-11/BERA-SS-11				
Chromium	Grubs, Earthworms	54.0	116	2.148
Vanadium		159	189	1.189
BERA-TI-12/BERA-SS-12				
Chromium	Earthworms	124	34.7	0.280
Vanadium		169	31.2	0.185
BERA-TI-13/BERA-SS-13				
Chromium	Crickets, Grasshoppers	2.30	5.42	2.357
Vanadium		5.10 U	3.77 U	-
BERA-TI-14/BERA-SS-14				
Chromium	Earthworms	19.7	5.23	0.265
Vanadium		40.8	8.96	0.220
Median BAFs				
Chromium				1.192

Table 3-3
Bioaccumulation Factor (BAF) for Surface Soil and Terrestrial Invertebrate Tissue Sampling Results
SMC Superfund Site
Newfield, New Jersey

Location/Sample	**Invertebrate Species**	**Surface Soil Concentration (mg/kg)**		**Terrestrial Invertebrate Concentration (mg/kg)**	**Bioaccumulation Factor (BAF)**
Vanadium					0.220
Reference Area					
BERA-TI-15/BERA-SS-15					
Chromium	Earthworms	11.8		14.0	1.186
Vanadium		15.5		9.77	0.630
BERA-TI-16/BERA-SS-16					
Chromium	Earthworms	1.9		16.8	8.842
Vanadium		5.1	U	9.45	-

Notes

J - Estimated value

U - Compound was not detected at specified quantitation limit

BAF calculated by dividing dry weight tissue concentration by dry weight surface soil concentration.

Table 4-1
Aquatic Invertebrate/Fish Toxicity Reference Values - Surface Water
SMC Superfund Site
Newfield, New Jersey

Surface Water COPEC	Concentration (ug/L)	Species	Endpoint	Reference
Total Recoverable Concentration				
Aluminum	87	All aquatic organisms	Chronic (CCC) Water Quality Criterion	USEPA, 2009
	89	Hyalella azteca	LC50	Borgmann et al., 2005
	540	Daphnids	Lowest Test EC20	Suter, 1996
	750	All aquatic organisms	Acute (CMC) Water Quality Criterion	USEPA, 2009
	1,900	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	3,288	Fish	Lowest Chronic Value for Fish	Suter, 1996
Dissolved Concentration				
Chromium	27.0	All aquatic organisms	Chronic (CCC) Water Quality Criterion	NJDEP, 2010
	40.0	All aquatic organisms	USEPA Chronic (CCC) Water Quality Criterion	USEPA, 2009
	< 44.0	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	68.6	Fish	Lowest Chronic Value for Fish	Suter, 1996
	565	All aquatic organisms	Acute (CMC) Water Quality Criterion	NJDEP, 2010
	> 1,000	Hyalella azteca	LC50	Borgmann et al., 2005
Copper	0.21	Daphnids	Lowest Test EC20	Suter, 1996
	0.23	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	3.80	Fish	Lowest Chronic Value for Fish	Suter, 1996
	4.46	All aquatic organisms	Chronic (CCC) Water Quality Criterion	NJDEP, 2010
	6.07	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	Suter, 1996
	6.26	All aquatic organisms	Acute (CMC) Water Quality Criterion	NJDEP, 2010
	36.0	Hyalella azteca	LC50	Borgmann et al., 2005
Iron	16.0	Daphnids	Lowest Test EC20	Suter, 1996
	158	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	1,000	All aquatic organisms	Chronic (CCC) Water Quality Criterion	USEPA, 2009
	1,300	Fish	Lowest Chronic Value for Fish	Suter, 1996
	1,640	Leptophlebia marginata	NOAEL - Survival (84 days exposure)	Gerhardt and Westermann, 1995
	> 1,000	Hyalella azteca	LC50	Borgmann et al., 2005
	73,070	Leptophlebia marginata	LC50	Gerhardt, 1995
Manganese	80.3	All aquatic organisms	Tier II - Secondary Chronic Value	Suter, 1996
	> 1,000	Hyalella azteca	LC50	Borgmann et al., 2005
	< 1,100	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	< 1,100	Daphnids	Lowest Test EC20	Suter, 1996
	1,470	All aquatic organisms	Tier II - Secondary Acute Value	Suter, 1996
	1,770	Fish	Lowest Chronic Value for Fish	Suter, 1996
Vanadium	19.1	All aquatic organisms	Tier II - Secondary Chronic Value	Suter, 1996
	80.0	Fish	Lowest Chronic Value for Fish	Suter, 1996
	284	All aquatic organisms	Tier II - Secondary Acute Value	Suter, 1996
	430	Daphnids	Lowest Test EC20	Suter, 1996
	> 980	Daphnids	Lowest Chronic Value for Daphnids	Suter, 1996
	1,251	Hyalella azteca	LC50	Borgmann et al., 2005
	4,500	Daphnia magna	LC50	Tomasik, et al., 1995

Table 4-2
Aquatic Invertebrate/Fish Risk Characterization - Surface Water
SMC Superfund Site
Newfield, New Jersey

Surface Water COPEC	Mean Concentration (ug/L)[1]	Effect Concentration (ug/L)[2]	Species	Endpoint	Hudson Branch	
					HQ[3]	# Samples > TRV[4]
Total Recoverable Concentration						
Aluminum	116	87	All aquatic organisms	Chronic (CCC) Water Quality Criterion	1E+00	10/13 = 80%
	116	89	Hyalella azteca	LC50	1E+00	9/13 = 69%
	116	540	Daphnids	Lowest Test EC20	2.E-01	0/13 = 0%
	116	750	All aquatic organisms	Acute (CMC) Water Quality Criterion	2.E-01	0/13 = 0%
	116	1,900	Daphnids	Lowest Chronic Value for Daphnids	6.E-02	0/13 = 0%
	116	3,288	Fish	Lowest Chronic Value for Fish	2.E-01	0/13 = 0%
Dissolved Concentration						
Chromium	16.7	12.9	All aquatic organisms	NJ Chronic (CCC) Water Quality Criterion	1.E+00	5/13 = 38%
	16.7	40.0	All aquatic organisms	USEPA Chronic (CCC) Water Quality Criterion	4.E-01	1/13 = 8%
	16.7	< 44.0	Daphnids	Lowest Chronic Value for Daphnids	4.E-01	1/13 = 8%
	16.7	68.6	Fish	Lowest Chronic Value for Fish	2.E-01	0/13 = 0%
	16.7	270	All aquatic organisms	Acute (CMC) Water Quality Criterion	6.E-02	0/13 = 0%
	16.7	> 1,000	Hyalella azteca	LC50	2.E-02	0/13 = 0%
Copper	3.04	0.21	Daphnids	Lowest Test EC20	1.5.E+01	13/13 = 100%
	3.04	0.23	Daphnids	Lowest Chronic Value for Daphnids	1.3.E+01	13/13 = 100%
	3.04	3.80	Fish	Lowest Chronic Value for Fish	8.E-01	5/13 = 38%
	3.04	4.46	All aquatic organisms	Chronic (CCC) Water Quality Criterion	7.E-01	2/13 = 15%
	3.04	6.07	Nondaphnid Invertebrates	Lowest Chronic Value for Nondaphnid Invertebrates	5.E-01	1/13 = 8%
	3.04	6.26	All aquatic organisms	Acute (CMC) Water Quality Criterion	5.E-01	1/13 = 8%
	3.04	36.0	Hyalella azteca	LC50	8.E-02	0/13 = 0%
Iron	663	16.0	Daphnids	Lowest Test EC20	4.1.E+01	13/13 = 100%
	663	158	Daphnids	Lowest Chronic Value for Daphnids	4E+00	13/13 = 100%
	663	1,000	All aquatic organisms	Chronic (CCC) Water Quality Criterion	7.E-01	2/13 = 15%
	663	1,399	Fish	Lowest Chronic Value for Fish	5.E-01	2/13 = 15%
	663	1,640	Leptophlebia marginata	NOAEL - Survival (84 days exposure)	4.E-01	2/13 = 15%
	663	> 1,000	Hyalella azteca	LC50	7.E-01	2/13 = 15%
	663	73,070	Leptophlebia marginata	LC50	9.E-03	0/13 = 0%
Manganese	194	80.3	All aquatic organisms	Tier II - Secondary Chronic Value	2.E+00	8/13 = 62%
	194	> 1,000	Hyalella azteca	LC50	2.E-01	1/13 = 8%
	194	< 1,100	Daphnids	Lowest Chronic Value for Daphnids	2.E-01	1/13 = 8%
	194	< 1,100	Daphnids	Lowest Test EC20	2.E-01	1/13 = 8%
	194	1,470	All aquatic organisms	Tier II - Secondary Acute Value	1.E-01	0/13 = 0%
	194	1,770	Fish	Lowest Chronic Value for Fish	1.E-01	0/13 = 0%
Vanadium	31.6	19.1	All aquatic organisms	Tier II - Secondary Chronic Value	2E+00	8/13 = 62%
	31.6	80.0	Fish	Lowest Chronic Value for Fish	4.E-01	0/13 = 0%
	31.6	284	All aquatic organisms	Tier II - Secondary Acute Value	1.E-01	0/13 = 0%
	31.6	430	Daphnids	Lowest Test EC20	7E-02	0/13 = 0%
	31.6	> 980	Daphnids	Lowest Chronic Value for Daphnids	3.E-02	0/13 = 0%
	31.6	1,251	Hyalella azteca	LC50	3.E-02	0/13 = 0%
	31.6	4,500	Daphnia magna	LC50	7.E-03	0/13 = 0%

Notes:
[1] Mean surface water concentration from Table B-1.
[2] Surface water TRVs identified in Table 4-1.
[3] HQ (Hazard Quotient) = Mean concentration / Surface water TRV.
[4] Includes non-detect results with Sample Quantification Limits greater than surface water TRV.

Table 4-3
Selection of Statistical Test for Surface Water COPECs
SMC Superfund Site
Newfield, New Jersey

COPEC	Hudson Branch Concentration (ug/L)			Reference Area Concentration (ug/L)			Normal Distribution?		Equal Variance Present for Data?	% Non-Detects Present		Statistical Test Selected
	# Samples	Mean	Max.	# Samples	Mean	Max.	Hudson Branch Data	Ref. Area Data		Hudson Branch Data	Ref. Area Data	
Total Recoverable Sampling Results												
Aluminum	13	116	239	8	220	612	No	No	-	0%	0%	Quantile/WMW Tests
Dissolved Sampling Results												
Chromium	13	16.7	49.5	8	ND	ND	-	-	-	38.5%	100%	None*
Copper	13	3.04	6.50	8	1.00	1.00	Yes	No	-	15.4%	87.5%	None*
Iron	13	663	2770	7	111	129	No	Yes	-	0%	14.3%	Quantile/WMW Tests
Manganese	13	194	1160	7	207	527	No	No	-	0%	0%	Quantile/WMW Tests
Vanadium	13	31.6	70.5	8	ND	ND	-	-	-	38.5%	100%	None*

Notes: Mean site and background concentrations from Tables B-1 and B-2
ND – Not Detected in these samples.
WMW – Wilcoxon Mann Whitney Test (equivalent to Wilcoxon Rank Sum Test)
Normality tested with Shapiro-Wilk Test via ProUCL 4.10
Equal Variance tested via ProUCL 4.10 for normally distributed data
*Detected infrequently in reference area samples – site concentrations concluded to be greater than reference area concentrations.

Table 4-4
Statistical Comparison with Reference Samples for Surface Water COPECs
SMC Superfund Site
Newfield, New Jersey

Hudson Branch vs. Burnt Mill Branch (Reference Area)					
Nonparametric Tests					
Quantile Test					
COPEC	Approx. R Value	Approx. K Value	# Site Obs. In R Largest	Calculated Alpha	Conclusion
Al - Total	5	5	2	0.0632	Perform WMW Test
Fe – Diss.	8	8	8	0.0102	Reject H_o (Site > Background)
Mn – Diss.	9	9	4	0.0102	Perform WMW Test
WMW Ranked Sum Test					
PCOPEC	Rank Sum W-Stat	WMW Test U Stat	WMW Critical Value	p-Value	Conclusion
Al - Total	111.5	20.5	75	0.99	Accept H_o (Site $\leq$ Background)
Mn – Diss.	114	23	66	0.966	Accept H_o (Site $\leq$ Background)

Notes: All statistical tests conducted with ProUCL 4.10.
K Value: number of observations of R largest (adjusted for ties in data)
R Value: target rank number (adjusted for ties in data)

Table 4-5
Aquatic Invertebrate Toxicity Reference Values - Sediment
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	Concentration (mg/kg)	Species	Endpoint	Reference
SVOCs				
Bis(2-ethylhexyl)phthalate	8,900*	Aquatic benthic organisms	Tier II - Secondary Chronic Value	Jones et al., 1997
Carbazole	35.6*	Daphnid	LC-50 (adjusted by uncertainty factor of 100)	EpiSuite
Dimethyl phthalate	2.27*	Daphnid	LC-50 (adjusted by uncertainty factor of 100)	EpiSuite
Acenaphthene	0.016	Aquatic benthic organisms	Effects Range - Low	Buchman, 2008
	0.50	Aquatic benthic organisms	Effects Range - Median	Buchman, 2008
Acenaphthylene	0.044	Aquatic benthic organisms	Effects Range - Low	Buchman, 2008
	0.64	Aquatic benthic organisms	Effects Range - Median	Buchman, 2008
Anthracene	0.057	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	0.845	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Benzo(a)anthracene	0.108	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	1.05	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Benzo(a)pyrene	0.150	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	1.45	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Benzo(g,h,i)perylene	0.17	Aquatic benthic organisms	Lowest Effect Level	Persaud et al., 1993
	17.3*	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
Benzo(k)fluoranthene	0.24	Aquatic benthic organisms	Lowest Effect Level	Persaud et al., 1993
	72.4*	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
Chrysene	0.166	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	1.29	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Dibenzo(a,h)anthracene	0.033	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	7.02*	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
Fluoranthene	0.423	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	2.23	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Indeno(1,2,3-cd)pyrene	0.20	Aquatic benthic organisms	Lowest Effect Level	Persaud et al., 1993
	17.3*	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
2-Methylnaphthalene	0.07	Aquatic benthic organisms	Effects Range - Low	Buchman, 2008
	0.67	Aquatic benthic organisms	Effects Range - Median	Buchman, 2008
Phenanthrene	0.204	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	1.17	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Pyrene	0.195	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	1.52	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Pesticides				
Dieldrin	0.0019	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	4.91*	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
4,4'-DDD	0.0049	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	0.32*	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
4,4'-DDE	0.0032	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	1.03*	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
4,4'-DDT	0.0042	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	3.83*	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
PCBs				
Aroclor 1248	-	-	-	-
Aroclor 1254	-	-	-	-
Aroclor 1260	-	-	-	-
Total PCBs	0.06	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	28.6*	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Inorganics				
Aluminum	25,500	Hyalella azteca	Threshold Effect Concentration	Ingersoll et al., 1996
Antimony	2.00	Aquatic benthic organisms	Effects Range - Low	Long and Morgan, 1990
	25.0	Aquatic benthic organisms	Effects Range - Median	Long and Morgan, 1990
Arsenic	9.79	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	33	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Barium	NA	-	-	-
Beryllium	NA	-	-	-
Cadmium	0.99	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	4.98	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Calcium	NA	-	-	-
Chromium	43.4	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	111	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Copper	31.6	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	149	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000

Table 4-5
Aquatic Invertebrate Toxicity Reference Values - Sediment
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	Concentration (mg/kg)	Species	Endpoint	Reference
Iron	20,000	Aquatic benthic organisms	Lowest Effect Level	Persaud et al., 1993
	40,000	Aquatic benthic organisms	Severe Effect Level	Persaud et al., 1993
Lead	35.8	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	128	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Magnesium	NA	-	-	-
Mercury	0.18	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	1.06	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Nickel	22.7	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	48.6	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000
Potassium	NA	-	-	-
Silver	1.0	Aquatic benthic organisms	Effects Range - Low	Long and Morgan, 1990
	2.2	Aquatic benthic organisms	Effects Range - Median	Long and Morgan, 1990
Vanadium	NA	-	-	-
Zinc	121	Aquatic benthic organisms	Threshold Effect Concentration	MacDonald et al., 2000
	459	Aquatic benthic organisms	Probable Effect Concentration	MacDonald et al., 2000

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

COPEC - Contaminant of potential ecological concern

NA - No benchmark available for this compound.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls

* Adjusted to mean organic carbon content of Hudson Branch sediment (5.4%)

Table 4-6
Aquatic Macroinvertebrate Risk Characterization - Sediment
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	Mean Concentration (mg/kg)[1]	Sediment TEC/ER-L TRV (mg/kg)[2]	Sediment PEC/SEL TRV (mg/kg)[2]	Sediment TEC/ER-L TRV		Sediment TEC/SEL TRV	
				HQ[3]	# Samples > TRV	HQ[3]	# Samples > TRV
SVOCs							
Bis(2-ethylhexyl)phthalate	0.32	8,900	-	3.6E-05	0/17 = 0%	-	-
Carbazole	0.13	35.6	-	3.7E-03	0/17 = 0%	-	-
Dimethyl phthalate	0.16	2.27	-	7.0E-02	0/17 = 0%	-	-
Acenaphthene	0.075	0.016	0.50	5E+00	1/17 = 6%	2E-01	0/17 = 0%
Acenaphthylene	0.096	0.044	0.64	2E+00	6/17 = 35%	2E-01	0/17 = 0%
Anthracene	0.09	0.057	0.85	2E+00	6/17 = 35%	1E-01	0/17 = 0%
Benzo(a)anthracene	0.14	0.108	1.05	1E+00	8/17 = 47%	1E-01	0/17 = 0%
Benzo(a)pyrene	0.17	0.150	1.45	1E+00	7/17 = 41%	1E-01	0/17 = 0%
Benzo(g,h,i)perylene	0.15	0.17	17.3	9E-01	5/17 = 29%	9E-03	0/17 = 0%
Benzo(k)fluoranthene	0.11	0.24	72.4	5E-01	1/17 = 6%	2E-03	0/17 = 0%
Chrysene	0.19	0.166	1.29	1E+00	7/17 = 41%	1E-01	0/17 = 0%
Dibenzo(a,h)anthracene	0.072	0.033	7.02	2E+00	5/17 = 29%	1E-02	0/17 = 0%
Fluoranthene	0.29	0.423	2.23	7E-01	4/17 = 24%	1E-01	0/17 = 0%
Indeno(1,2,3-cd)pyrene	0.13	0.20	17.3	7E-01	2/17 = 12%	8E-03	0/17 = 0%
2-Methylnaphthalene	0.14	0.07	0.67	2E+00	1/17 = 6%	2E-01	0/17 = 0%
Phenanthrene	0.17	0.204	1.17	8E-01	5/17 = 29%	1E-01	0/17 = 0%
Pyrene	0.30	0.195	1.52	2E+00	8/17 = 47%	2E-01	0/17 = 0%
Pesticides							
Dieldrin	0.0017	0.0019	0.0618	9E-01	2/17 = 12%	3E-02	0/17 = 0%
4,4'-DDD	0.0061	0.0049	0.0280	1E+00	6/17 = 35%	2E-01	1/17 = 6%
4,4'-DDE	0.0040	0.0032	0.0313	1E+00	6/17 = 35%	1E-01	0/17 = 0%
4,4'-DDT	0.0035	0.0042	0.0629	8E-01	6/17 = 35%	6E-02	0/17 = 0%
PCBs							
Aroclor 1248	0.092	-	-				
Aroclor 1254	0.079	-	-				
Aroclor 1260	0.079	-	-				
Total PCBs	0.13	0.060	0.676	2E+00	5/17 = 29%	2E-01	0/17 = 0%
Inorganics							
Aluminum	11,535	25,500	-	5E-01	4/23 = 17%	-	-
Antimony	8.89	2.0	25	4E+00	9/29 = 31%	4E-01	3/29 = 10%
Arsenic	8.29	9.79	33	8E-01	7/33 = 21%	3E-01	1/33 = 3%
Barium	133	NA	NA	-	-	-	-
Beryllium	1.23	NA	NA	-	-	-	-
Cadmium	1.05	0.99	4.98	1E+00	4/33 = 12%	2E-01	0/33 = 0%
Calcium	1,389	NA	NA	-	-	-	-
Chromium	1,923	43.4	111	4.4E+01	33/39 = 85%	1.7E+01	30/39 = 77%
Copper	76.8	31.6	149	2E+00	18/39 = 46%	5E-01	7/39 = 18%
Iron	13,105	20,000	40,000	7E-01	8/33 = 24%	3E-01	0/33 = 0%
Lead	83.6	35.8	128	2E+00	18/39 = 46%	7E-01	9/39 = 23%
Magnesium	1,168	NA	NA	-	-	-	-
Mercury	0.62	0.18	1.06	3E+00	25/39 = 64%	6E-01	6/39 = 15%
Nickel	136	22.7	48.6	6E+00	26/39 = 67%	3E+00	20/39 = 51%
Potassium	1,778	NA	NA	-	-	-	-
Silver	0.96	1.0	2.2	9.6E-01	0/23 = 0%	4E-01	0/23 = 0%
Vanadium	486	NA	NA	-	-	-	-
Zinc	131	121	459	1E+00	13/39 = 33%	3E-01	1/39 = 3%

Notes:
[1] Mean sediment concentration from Table B-3.
[2] Sediment TRVs identified in Table 4-5.
[3] HQ (Hazard Quotient) = Mean concentration / Sediment TRV.

Table 4-7
Selection of Statistical Test for Sediment COPECs
SMC Superfund Site
Newfield, New Jersey

COPEC	Hudson Branch Concentration (mg/kg)			Reference Area Concentration (mg/kg)			Normal Distribution?		Equal Variance Present for Data?	% Non-Detects Present		Statistical Test Selected
	# Samples	Mean	Max.	# Samples	Mean	Max.	Hudson Branch Data	Ref. Area Data		Hudson Branch Data	Ref. Area Data	
4',4-DDD	17	0.0061	0.0296	8	0.021	0.136	No	No	-	41%	50%	Quantile/WMW Test
4',4-DDE	17	0.0040	0.0106	8	0.0058	0.0143	Yes	Yes	-	35%	50%	Quantile/WMW Test
4',4-DDT	17	0.0035	0.0107	8	0.011	0.0415	Yes	No	-	59%	25%	Quantile/WMW Test
Dieldrin	17	0.0017	0.0050	8	0.0035	0.0073	Yes	NC	-	76%	88%	None**
Aluminum	23	11,535	37,800	8	8,270	21,800	No	Yes	-	0%	0%	Quantile/WMW Test
Antimony	29	8.89	34.3	8	ND	ND	-	-	-	70%	100%	None*
Arsenic	33	8.29	34.7	10	8.87	2.30	No	NC	-	27%	90%	None*
Barium	29	133	394	8	161	430	No	Yes	-	10%	25%	Quantile/WMW Test
Beryllium	29	1.23	10.7	8	2.48	6.40	No	Yes	-	59%	12%	Quantile/WMW Test
Cadmium	33	1.05	2.50	10	ND	ND	-	-	-	82%	100%	None*
Calcium	23	1,389	3,110	8	2,525	5,190	Yes	Yes	-	39%	50%	Quantile/WMW Test
Chromium	39	1,923	10,200	10	12.7	38.3	No	Yes	-	3%	10%	Quantile/WMW Test
Copper	39	76.8	33.3	10	13.9	28.3	No	Yes	-	8%	50%	Quantile/WMW Test
Iron	33	13,105	36,000	10	9,859	25,200	No	Yes	-	0%	0%	Quantile/WMW Test
Lead	39	83.6	318	10	44.6	91.9	No	Yes	-	3%	0%	Quantile/WMW Test
Magnesium	23	1,168	2,360	8	ND	ND	-	-	-	70%	100%	None*
Mercury	39	0.62	2.50	10	1.98	12.7	No	No	-	5%	0%	Quantile/WMW Test
Nickel	39	136	1,140	10	20.4	60.8	No	Yes	-	8%	30%	Quantile/WMW Test
Potassium	23	1,778	1,200	8	ND	ND	-	-	-	91%	100%	None*
Vanadium	29	486	3,280	8	21.5	5.40	No	No	-	3%	88%	None*
Zinc	39	131	525	10	59.7	197	No	No	-	0%	0%	Quantile/WMW Test

Table 4-7
Selection of Statistical Test for Sediment COPECs
SMC Superfund Site
Newfield, New Jersey

Notes: Mean site and background concentrations from Tables B-3 and B-4
NC – Not Calculated due to low frequency of detection.
ND – Not Detected in background samples.
WMW – Wilcoxon Mann Whitney Test (equivalent to Wilcoxon Rank Sum Test)
Normality tested with Shapiro-Wilk Test via ProUCL 4.10
Equal Variance tested via ProUCL 4.10 for normally distributed data
*Detected infrequently in reference area samples – site concentrations concluded to be greater than reference area concentrations.
**Detected infrequently in both Site and reference area samples – site concentrations concluded to be ≤ to reference area based on mean/max. concentrations.

Table 4-8
Statistical Comparison with Reference Samples for Sediment COPECs
SMC Superfund Site
Newfield, New Jersey

Hudson Branch vs. Burnt Mill Branch (Reference Area)					
Nonparametric Tests					
Quantile Test					
COPEC	Approx. R Value	Approx. K Value	# Site Obs. In R Largest	Calculated Alpha	Conclusion
4',4-DDD	5	5	3	0.103	Perform WMW Test
4',4-DDE	5	5	3	0.103	Perform WMW Test
4',4-DDT	5	5	2	0.103	Perform WMW Test
Aluminum	8	8	7	0.0622	Perform WMW Test
Barium	9	9	7	0.0805	Perform WMW Test
Beryllium	9	9	5	0.0805	Perform WMW Test
Calcium	9	9	5	NC	Perform WMW Test
Chromium	12	12	12	0.0424	Reject H_o (Site > Background)
Copper	12	12	12	0.0424	Reject H_o (Site > Background)
Iron	10	10	8	0.0483	Perform WMW Test
Lead	12	12	12	0.0424	Reject H_o (Site > Background)
Mercury	10	10	8	0.0424	Perform WMW Test
Nickel	12	12	12	0.0424	Reject H_o (Site > Background)
Zinc	12	12	11	0.0424	Perform WMW Test
WMW Ranked Sum Test					
PCOPEC	Rank Sum W-Stat	WMW Test U Stat	WMW Critical Value	p-Value	Conclusion
4',4-DDD	204	68	91	0.415	Accept H_o (Site $\leq$ Background)
4',4-DDE	201	65	91	0.488	Accept H_o (Site $\leq$ Background)
4',4-DDT	185	49	91	0.829	Accept H_o (Site $\leq$ Background)
Aluminum	382	0.609	1.645	0.271	Accept H_o (Site $\leq$ Background)
Barium	547.5	-0.148	1.645	0.559	Accept H_o (Site $\leq$ Background)
Beryllium	502.5	-1.808	1.645	0.965	Accept H_o (Site $\leq$ Background)
Calcium	360	-0.384	1.645	0.649	Accept H_o (Site $\leq$ Background)
Iron	756	0.848	1.645	0.198	Accept H_o (Site $\leq$ Background)
Mercury	902	-1.823	1.645	0.966	Accept H_o (Site $\leq$ Background)
Zinc	1049	1.823	1.645	0.0341	Reject H_o (Site > Background)

Notes: All statistical tests conducted with ProUCL 4.10.
K Value: number of observations of R largest (adjusted for ties in data)
R Value: target rank number (adjusted for ties in data)
NC – Quantile test not conducted as non-detect values in largest observation.

Table 4-9a
2009 Toxicity Test Results and Sediment Concentrations
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	**Sediment PEC TRV (mg/kg)** [1]	**Control Sample**	**Hudson Branch Samples**				**Reference Area**
			SD-9A	**SD-17**	**SD-18**	**SD-19**	**SD-35**
Toxicity Test Parameters							
Chironomus tentans							
10 Days - Survival (%)	-	96.3	97.5	87.5	92.5	92.6	66.2*
10 Days - Growth (mg)	-	1.68	1.15*	1.67	1.44*	1.31*	1.36*
Hyalella azteca							
28 Days - Survival (%)	-	86.2	87.5	87.5	90.0	97.5	97.5
28 Days - Growth (mg)	-	0.20	0.20	0.18	0.26	0.24	0.24
Sediment Chemistry Analysis (mg/kg) [2]							
Arsenic	33.0	-	5.5 J	15.6 J	27.5 J	2.4 J	10 UJ
Cadmium	4.98	-	1.2 J	0.59 J	2.6 UJ	0.51 UJ	2.60 UJ
Chromium	111	-	**5440**	**3150**	**6160**	**388**	38.3 J
Copper	149	-	80.4 J	147 J	**230 J**	22.9 J	28.3 J
Lead	128	-	124 J	**156 J**	**177 J**	25.8 J	91.9 J
Nickel	48.6	-	**114 J**	**356 J**	**332 J**	**52.7 J**	22.3 J
Zinc	459	-	231 J	192 J	258 J	39.1 J	87.6 J

Notes:
[1] Sediment PEC TRVs identified in Table 4-5.
[2] Sediment concentrations from Table A-3.
Sediment concentrations in **bold** exceed their PEC TRV.
* Result is statistically significant from control sample.

Table 4-9b
2011 Toxicity Test Results and Sediment Concentrations
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	Sediment PEC TRV (mg/kg) [1]	Control Sample	Hudson Branch Samples						Reference Area Samples	
			SD-10	SD-13	SD-15	SD-18	SD-04	SD-23	SD-31	SD-35
Toxicity Test Parameters (*Hyalella azteca*)										
Survival (Percent)										
28 Days	-	91.3	87.5	100.0	88.8	2.5**	98.8	96.3	96.3	96.3
35 Days	-	91.3	85.0	97.5	87.5	2.5**	98.8	96.3	96.3	93.8
42 Days	-	87.5	83.8	96.3	83.8	1.3**	96.4	95.0	91.3	81.3
Growth (mg) - 42 days	-	0.33	0.35	0.36	0.37	0.40	0.33	0.37	0.33	0.35
Reproduction (neonates/female)	-	3.69	2.85	3.37	3.64	0.00**	2.62*	4.37	3.17	5.11
Sediment Chemistry Analysis (mg/kg) [2]										
Total PAHs	22.8	-	3.21	2.07	0.08	1.99	0.64	0.68	0.15 U	1.83
Total PCBs	0.68	-	0.05 U	0.13 U	0.42	0.29	0.06 U	0.04 U	0.16 U	0.14 U
Antimony	25.0	-	3.05	8.50 U	18.9	16.7	3.80 U	3.10 U	2.00 U	9.90 U
Arsenic	33.0	-	2.90	25.9	7.40	8.20	3.80	3.10 U	2.30	9.90 U
Cadmium	4.98	-	0.48 U	2.10 U	1.20 U	1.20 U	0.94 U	0.76 U	0.50 U	2.50 U
Chromium	111	-	**473**	**6295**	**2890**	**2580**	**630**	**500**	3.40	15.0
Copper	149	-	66.0	**223**	118	81.1	30.1	13.8	3.60	14.2
Lead	128	-	48.4	**303**	70.5	107	33.4	13.2	11.6	38.9
Nickel	48.6	-	**50.6**	**193**	**239**	**158**	**73.1**	16.4	5.60	20.0 U
Vanadium	NA	-	203	945	554	595	176	93.1	5.40	25.0 U
Zinc	459	-	99.4	321	117	96.0	61.7	27.4	11.0	24.5

Notes:
[1] Sediment PEC TRVs identified in Table 4-5.
[2] Sediment concentrations from Table A-3.
Sediment concentrations in **bold** exceed their PEC TRV.
* Result is statistically significant from control sample.
** Result is statistically significant from control sample and reference area samples.

Table 4-10
Exposure Factors for Selected Semi-Aquatic Receptor Species
SMC Superfund Site
Newfield, New Jersey

CHARACTER	VALUE	SOURCE	COMMENT
BODY WEIGHT			
Muskrat	1.35 kg	Dozier (1950) cited in USEPA (1993)	Adult breeding female in New York in winter
Mallard	1.04 kg	Nelson and Martin (1953) cited in USEPA (1993)	Mean of adult females throughout North America
Little Brown Bat	0.0075 kg	Gould (1955) cited in Sample and Suter (1994)	-
Tree Swallow	0.021 kg	Dunning (1993) cited in Sample et al. (1997)	Mean of adults in Pennsylvania
FOOD INGESTION RATE			
Muskrat	0.0794 kg/day (dry weight)	Nagy (2001)	Value for herbivorous mammals
Mallard	0.0744 kg/day (dry weight)	Nagy (2001)	Value for all birds
Little Brown Bat	0.0016 kg/day (dry weight)	Nagy (2001)	Value for little brown bat
Tree Swallow	0.0116 kg/day (dry weight)	Nagy (2001)	Value for tree swallow
SURFACE WATER INGESTION RATE			
Muskrat	0.130 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Mallard	0.058 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Little Brown Bat	0.001 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Tree Swallow	0.004 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
SEDIMENT/SOIL INGESTION			
Muskrat	0.0019 kg/day (dry weight)	Beyer et al. (in press) cited in USEPA (1993)	Based on 2.4% of diet (dry weight) for meadow vole
Mallard	0.0015 kg/day (dry weight)	Beyer et al. (in press) cited in USEPA (1993)	Based on 2% of diet (dry weight) for mallard
Little Brown Bat	0.00 kg/day	Sample and Suter (1994)	Aerial insectivore - negligible
Tree Swallow	0.00 kg/day	Sample et al., (1997)	Aerial insectivore - negligible
DIET COMPOSITION			
Muskrat	100% Vegetation	USEPA (1993)	Conservative for this exposure pathway
Mallard	100% Vegetation	USEPA (1993)	Conservative for this exposure pathway
Little Brown Bat	100% Aquatic Invertebrates	USEPA (1997)	Conservative for this exposure pathway
Tree Swallow	100% Aquatic Invertebrates	Sample et al., (1997)	Conservative for this exposure pathway
AREA USE FACTOR			
All Species	1	USEPA (1997)	Conservatively assumed home range entirely within area of contamination
TEMPORAL USE FACTOR			
All Species	1	USEPA (1997)	Conservatively assumed to be present throughout the year

Table 4-11
Muskrat and Mallard - Mean UCL and Mean Estimated COPEC Exposure Doses - Hudson Branch
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	Mean UCL Sediment Concentration (mg/kg) [1]	Mean UCL Aquatic Vegetation Concentration (mg/kg)[2]	Mean UCL Surface Water Concentration (mg/L)[3]	Food Ingestion Rate (kg/day)[4]	Sediment Ingestion Rate (kg/day)[4]	Surface Water Ingestion Rate (L/day)[4]	Body Weight (kg)[4]	Area Use Factor[4]	Temporal Use Factor[4]	Aquatic Plant Exposure Dose (mg/kg/BW-day)[5]	Sediment Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW day)[8]
Muskrat													
Chromium	3.61E+03	4.91E+02	4.20E-02	0.0794	0.0019	0.130	1.35	1.00	1.00	2.89E+01	5.08E+00	4.04E-03	3.40E+01
Mallard													
Chromium	3.61E+03	4.91E+02	4.20E-02	0.0744	0.0015	0.058	1.04	1.00	1.00	3.51E+01	5.21E+00	2.34E-03	4.03E+01
Sediment COPEC	**Mean Sediment Concentration (mg/kg) [1]**	**Mean Aquatic Vegetation Concentration (mg/kg)[2]**	**Mean Surface Water Concentration (mg/L)[3]**	**Food Ingestion Rate (kg/day)[4]**	**Sediment Ingestion Rate (kg/day)[4]**	**Surface Water Ingestion Rate (L/day)[4]**	**Body Weight (kg)[4]**	**Area Use Factor[4]**	**Temporal Use Factor[4]**	**Aquatic Plant Exposure Dose (mg/kg/BW-day)[5]**	**Sediment Exposure Dose (mg/kg/BW-day)[6]**	**Surface Water Exposure Dose (mg/kg/BW-day)[7]**	**Total Mean Exposure Dose (mg/kg/BW-day)[8]**
Muskrat													
Chromium	1.92E+03	2.62E+02	1.90E-02	0.0794	0.0019	0.130	1.35	1.00	1.00	1.54E+01	2.71E+00	1.83E-03	1.81E+01
Mallard													
Chromium	1.92E+03	2.62E+02	1.90E-02	0.0744	0.0015	0.058	1.04	1.00	1.00	1.87E+01	2.77E+00	1.06E-03	2.15E+01

Notes:

[1] Mean and mean UCL sediment concentrations from Hudson Branch (see Table B-3).

[2] Mean and mean UCL aquatic vegetation concentration calculated by multiplying sediment concentration by BAF of 0.136 (Table 3-1).

[3] Mean and mean UCL surface water concentrations from Table B-1.

[4] from Table 4-10.

[5] Mean or mean UCL plant concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[6] Mean or mean UCL sediment concentration * sediment ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Mean or mean UCL surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean or mean UCL vegetation, sediment and surface water exposure doses.

Table 4-12
Little Brown Bat and Tree Swallow - Mean UCL and Mean Estimated COPEC Exposure Doses - Hudson Branch
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	Mean UCL Sediment Concentration (mg/kg) [1]	BAF[2]	Mean UCL Aquatic Invertebrate Concentration (mg/kg)[3]	Mean UCL Surface Water Concentration (mg/L)[4]	Food Ingestion Rate (kg/day)[5]	Surface Water Ingestion Rate (L/day)[5]	Body Weight (kg)[5]	Area Use Factor[5]	Temporal Use Factor[5]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW-day)[8]
Little Brown Bat												
Antimony	3.43E+01	0.000	0.00E+00	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	0.00E+00	0.00E+00	0.00E+00
Chromium	3.61E+03	0.046	1.66E+02	4.20E-02	0.0016	0.001	0.0075	1.00	1.00	3.54E+01	5.60E-03	3.54E+01
Vanadium	1.06E+03	0.435	4.62E+02	8.00E-02	0.0016	0.001	0.0075	1.00	1.00	9.85E+01	1.07E-02	9.85E+01
Tree Swallow												
Barium	1.73E+02	0.198	3.42E+01	0.00E+00	0.0116	0.004	0.021	1.00	1.00	1.89E+01	0.00E+00	1.89E+01
Chromium	3.61E+03	0.046	1.66E+02	4.20E-02	0.0116	0.004	0.021	1.00	1.00	9.17E+01	8.00E-03	9.17E+01
Copper	1.65E+02	0.313	5.15E+01	8.00E-03	0.0116	0.004	0.021	1.00	1.00	2.85E+01	1.52E-03	2.85E+01
Mercury	1.12E+00	0.270	3.01E-01	0.00E+00	0.0116	0.004	0.021	1.00	1.00	1.66E-01	0.00E+00	1.66E-01
Vanadium	1.06E+03	0.435	4.62E+02	8.00E-02	0.0116	0.004	0.021	1.00	1.00	2.55E+02	1.52E-02	2.55E+02

Sediment COPEC	Mean Sediment Concentration (mg/kg) [1]	BAF[2]	Mean Aquatic Invertebrate Concentration (mg/kg)[3]	Mean Surface Water Concentration (mg/L)[4]	Food Ingestion Rate (kg/day)[5]	Surface Water Ingestion Rate (L/day)[5]	Body Weight (kg)[5]	Area Use Factor[5]	Temporal Use Factor[5]	Aquatic Invertebrate Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean Exposure Dose (mg/kg/BW-day)[8]
Little Brown Bat												
Antimony	8.90E+00	0.000	0.00E+00	0.00E+00	0.0016	0.001	0.0075	1.00	1.00	0.00E+00	0.00E+00	0.00E+00
Chromium	1.92E+03	0.046	8.85E+01	1.90E-02	0.0016	0.001	0.0075	1.00	1.00	1.89E+01	2.53E-03	1.89E+01
Vanadium	4.87E+02	0.435	2.12E+02	3.86E-02	0.0016	0.001	0.0075	1.00	1.00	4.51E+01	5.15E-03	4.52E+01
Tree Swallow												
Barium	1.33E+02	0.198	2.63E+01	0.00E+00	0.0116	0.004	0.021	1.00	1.00	1.45E+01	0.00E+00	1.45E+01
Chromium	1.92E+03	0.046	8.85E+01	1.90E-02	0.0116	0.004	0.021	1.00	1.00	4.89E+01	3.62E-03	4.89E+01
Copper	7.68E+01	0.313	2.40E+01	3.92E-03	0.0116	0.004	0.021	1.00	1.00	1.33E+01	7.47E-04	1.33E+01
Mercury	6.22E-01	0.270	1.68E-01	0.00E+00	0.0116	0.004	0.021	1.00	1.00	9.28E-02	0.00E+00	9.28E-02
Vanadium	4.87E+02	0.435	2.12E+02	3.86E-02	0.0116	0.004	0.021	1.00	1.00	1.17E+02	7.35E-03	1.17E+02

Notes:

1 Mean and mean UCL sediment concentrations from Hudson Branch (see Table B-3).

2 BAFs from Table 3-2.

3 Mean and mean UCL aquatic invertebrate concentrations calculated by multiplying sediment concentration by BAF.

4 Mean and mean UCL surface water concentrations from Table B-1.

5 from Table 4-10.

6 Mean or mean UCL aquatic invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

7 Mean or mean UCL surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

8 Sum of mean or mean UCL aquatic invertebrate and surface water exposure doses.

Table 4-13
Avian and Mammalian Chronic Toxicity Reference Values
SMC Superfund Site
Newfield, New Jersey

COPEC	Avian NOAEL	Avian LOAEL		Reference	Avian MATC TRV (mg/kg-BW/day)[c]	Mammalian NOAEL	Mammalian LOAEL		Reference	Mammal MATC TRV (mg/kg-BW/day)[c]
Inorganics										
Antimony	NA	NA		-	-	0.059	2.76	b	USEPA, 2005a	0.40
Barium	20.8	41.7		Sample et al., 1996	29.5	NA	NA		-	-
Chromium	2.66	15.7	b	USEPA, 2008	6.46	2.40	58.2	b	USEPA, 2008	11.8
Copper	18.5	34.9	b	USEPA, 2007a	25.4	NA	NA		-	-
Mercury	0.039	0.195	a	USEPA, 2002	0.087	NA	NA		-	-
Vanadium	1.19	1.70	b	USEPA, 2005b	1.42	5.92	9.44	b	USEPA, 2005b	7.48

Notes:

COPEC - contaminant of potential ecological concern

MATC - maximum acceptable toxicant concentration

NOAEL - no observable adverse effect level

LOAEL - lowest observable adverse effect level

NA = Toxicity reference value not applicable since not a COPEC for avian or mammalian receptors.

a: Uncertainty factor of 5 applied to NOAEL

b: Geometric mean of NOAELs/LOAELs for reproduction and growth.

c: Geometric mean of NOAEL and LOAEL TRVs.

Table 4-14
Semi-Aquatic Wildlife Receptors Mean UCL and Mean Risk Characterization - Hudson Branch
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	Avian MATC TRV (mg/kg-BW/day) [1]	Mammalian MATC TRV (mg/kg-BW/day) [2]	Mean UCL Muskrat Dose (mg/kg/BW-day) [3]	Mean UCL Mallard Dose (mg/kg/BW-day) [3]	Mean UCL Little Brown Bat Dose (mg/kg/BW-day) [4]	Mean UCL Tree Swallow Dose (mg/kg/BW-day) [4]	Mean UCL Muskrat MATC HQ[5]	Mean UCL Mallard MATC HQ[5]	Mean UCL Little Brown Bat MATC HQ[5]	Mean UCL Tree Swallow MATC HQ[5]
Antimony	NA	0.40	NRP	NRP	0.00E+00	NRP	-	-	0E+00	-
Barium	29.5	-	NRP	NRP	NRP	1.89E+01	-	-	-	6E-01
Chromium	6.46	11.8	3.40E+01	4.03E+01	3.54E+01	9.17E+01	3E+00	6E+00	3E+00	1.4E+01
Copper	25.4	-	NRP	NRP	NRP	2.85E+01	-	-	-	1E+00
Mercury	0.087	-	NRP	NRP	NRP	1.66E-01	-	-	-	2E+00
Vanadium	1.42	9.44	NRP	NRP	9.85E+01	2.55E+02	-	-	1.0.E+01	1.8E+02
						Total Hazard Index	3E+00	6E+00	1.3.E+01	1.97.E+02
Sediment COPEC	**Avian MATC TRV (mg/kg-BW/day) [1]**	**Mammalian MATC TRV (mg/kg-BW/day) [2]**	**Mean Muskrat Dose (mg/kg/BW-day) [3]**	**Mean Mallard Dose (mg/kg/BW-day) [3]**	**Mean Little Brown Bat Dose (mg/kg/BW-day) [4]**	**Mean Tree Swallow Dose (mg/kg/BW-day) [4]**	**Mean Muskrat MATC HQ[5]**	**Mean Mallard MATC HQ[5]**	**Mean Little Brown Bat MATC HQ[5]**	**Mean Tree Swallow MATC HQ[5]**
Antimony	NA	0.40	NRP	NRP	0.00E+00	NRP	-	-	0E+00	-
Barium	29.5	-	NRP	NRP	NRP	1.45E+01	-	-	-	5E-01
Chromium	6.46	9.18	1.81E+01	2.15E+01	1.89E+01	4.89E+01	2E+00	3E+00	2E+00	8E+00
Copper	25.40	-	NRP	NRP	NRP	1.33E+01	-	-	-	5E-01
Mercury	0.087	-	NRP	NRP	NRP	9.28E-02	-	-	-	1E+00
Vanadium	1.42	6.04	NRP	NRP	4.52E+01	1.17E+02	-	-	7E+00	8.2E+01
						Total Hazard Index	2E+00	3E+00	1E+01	9.2E+01

Notes:

[1] Avian MATC TRVs from Table 4-13 (applies to mallard and tree swallow).

[2] Mammalian MATC TRVs from Table 4-13 (applies to muskrat and little brown bat).

[3] Mean UCL and mean muskrat and mallard exposure doses from Table 4-11.

[4] Mean UCL and mean little brown bat and tree swallow exposure doses from Table 4-12.

[5] HQ (Hazard Quotient) = Mean or Mean UCL exposure dose / TRV.

NA - Not available

NRP - No risk predicted (not at risk based on results of SLERA).

Table 4-15
Exposure Factors for Selected Terrestrial Receptor Species
SMC Superfund Site
Newfield, New Jersey

CHARACTER	VALUE	SOURCE	COMMENT
BODY WEIGHT			
American Robin	0.077 kg	Dunning (1984) cited in USEPA (1993)	-
Short-tailed Shrew	0.015 kg	Schlessinger and Potter (1974) cited in USEPA (1993)	Breeding adults
FOOD INGESTION RATE			
American Robin	0.0094 kg/day (dryweight)	Nagy (2001)	Value for temperate forest birds
Short-tailed Shrew	0.0020 kg/day (dry weight)	Nagy (2001)	Value for insectivorous mammals
SURFACE WATER INGESTION RATE			
American Robin	0.011 L/day	Calder and Braun (1983) equation cited in USEPA (1993)	Based on body weight cited above
Short-tailed Shrew	0.003 L/day	Chew (1951) cited in Sample and Suter (1994)	-
SEDIMENT/SOIL INGESTION			
American Robin	0.00 kg/day	-	Earthworms collected for BERA were not duprated - assumed to contain soil
Short-tailed Shrew	0.00 kg/day	-	
DIET COMPOSITION			
American Robin	100% Terrestrial Invertebrates	USEPA (1997)	Conservative for this exposure pathway
Short-tailed Shrew	100% Terrestrial Invertebrates	USEPA (1997)	Conservative for this exposure pathway
AREA USE FACTOR			
All Species	1	USEPA (1997)	Conservatively assumed home range entirely within area of contamination
TEMPORAL USE FACTOR			
All Species	1	USEPA (1997)	Conservatively assumed to be present throughout the year

Table 4-16
Short-Tailed Shrew and American Robin - Mean UCL and Mean Estimated COPEC Exposure Doses - Eastern Storage Areas
SMC Superfund Site
Newfield, New Jersey

Surface Soil COPEC	Mean UCL Surface Soil Concentration (mg/kg) [1]	BAF[2]	Mean UCL Terrestrial Invertebrate Concentration (mg/kg)[3]	Mean UCL Surface Water Concentration (mg/L)[4]	Food Ingestion Rate (kg/day)[5]	Surface Water Ingestion Rate (L/day)[5]	Body Weight (kg)[5]	Area Use Factor[5]	Temporal Use Factor[5]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW-day)[8]
Short-Tailed Shrew												
Chromium	2.41E+02	1.192	2.87E+02	4.20E-02	0.0020	0.003	0.015	1.00	1.00	3.82E+01	8.40E-03	3.82E+01
Vanadium	2.12E+03	0.220	4.67E+02	8.00E-02	0.0020	0.003	0.015	1.00	1.00	6.23E+01	1.60E-02	6.23E+01
American Robin												
Chromium	2.41E+02	1.192	2.87E+02	4.20E-02	0.0094	0.011	0.077	1.00	1.00	3.50E+01	6.00E-03	3.50E+01
Vanadium	2.12E+03	0.220	4.67E+02	8.00E-02	0.0094	0.011	0.077	1.00	1.00	5.70E+01	1.14E-02	5.70E+01
Surface Soil COPEC	**Mean Surface Soil Concentration (mg/kg) [1]**	**BAF[2]**	**Mean Terrestrial Invertebrate Concentration (mg/kg)[3]**	**Mean Surface Water Concentration (mg/L)[4]**	**Food Ingestion Rate (kg/day)[5]**	**Surface Water Ingestion Rate (L/day)[5]**	**Body Weight (kg)[5]**	**Area Use Factor[5]**	**Temporal Use Factor[5]**	**Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[6]**	**Surface Water Exposure Dose (mg/kg/BW-day)[7]**	**Total Mean Exposure Dose (mg/kg/BW-day)[8]**
Short-Tailed Shrew												
Chromium	1.62E+02	1.192	1.93E+02	1.90E-02	0.0020	0.003	0.015	1.00	1.00	2.57E+01	3.80E-03	2.57E+01
Vanadium	1.02E+03	0.220	2.24E+02	3.86E-02	0.0020	0.003	0.015	1.00	1.00	2.98E+01	7.72E-03	2.98E+01
American Robin												
Chromium	1.62E+02	1.192	1.93E+02	1.90E-02	0.0094	0.011	0.077	1.00	1.00	2.35E+01	2.71E-03	2.35E+01
Vanadium	1.02E+03	0.220	2.24E+02	3.86E-02	0.0094	0.011	0.077	1.00	1.00	2.73E+01	5.51E-03	2.73E+01

Notes:

[1] Mean and mean UCL surface soil concentrations from eastern storage areas (see Table B-5).

[2] BAFs from Table 3-3.

[3] Mean and mean UCL terrestrail invertebrate concentrations calculated by multiplying surface soil concentration by BAF.

[4] Mean and mean UCL surface water concentrations from Table B-1.

[5] from Table 4-15.

[6] Mean or mean UCL terrestrial invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

[7] Mean or mean UCL surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

[8] Sum of mean or mean UCL terrestrial invertebrate and surface water exposure doses.

Table 4-17
Short-Tailed Shrew and American Robin - Mean UCL and Mean Estimated COPEC Exposure Doses - Hudson Branch Wetland
SMC Superfund Site
Newfield, New Jersey

Surface Soil COPEC	Mean UCL Surface Soil Concentration (mg/kg) [1]	BAF[2]	Mean UCL Terrestrial Invertebrate Concentration (mg/kg)[3]	Mean UCL Surface Water Concentration (mg/L)[4]	Food Ingestion Rate (kg/day)[5]	Surface Water Ingestion Rate (L/day)[5]	Body Weight (kg)[5]	Area Use Factor[5]	Temporal Use Factor[5]	Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[6]	Surface Water Exposure Dose (mg/kg/BW-day)[7]	Total Mean UCL Exposure Dose (mg/kg/BW-day)[8]
Short-Tailed Shrew												
Chromium	1.92E+03	0.338	6.49E+02	4.20E-02	0.0020	0.003	0.015	1.00	1.00	8.65E+01	8.40E-03	8.65E+01
American Robin												
Chromium	1.92E+03	0.338	6.49E+02	4.20E-02	0.0094	0.011	0.077	1.00	1.00	7.92E+01	6.00E-03	7.92E+01
Vanadium	1.63E+03	0.361	5.87E+02	8.00E-02	0.0094	0.011	0.077	1.00	1.00	7.17E+01	1.14E-02	7.17E+01
Surface Soil COPEC	**Mean Surface Soil Concentration (mg/kg) [1]**	**BAF[2]**	**Mean Terrestrial Invertebrate Concentration (mg/kg)[3]**	**Mean Surface Water Concentration (mg/L)[4]**	**Food Ingestion Rate (kg/day)[5]**	**Surface Water Ingestion Rate (L/day)[5]**	**Body Weight (kg)[5]**	**Area Use Factor[5]**	**Temporal Use Factor[5]**	**Terrestrial Invertebrate Exposure Dose (mg/kg/BW-day)[6]**	**Surface Water Exposure Dose (mg/kg/BW-day)[7]**	**Total Mean Exposure Dose (mg/kg/BW-day)[8]**
Short-Tailed Shrew												
Chromium	6.69E+02	0.338	2.26E+02	1.90E-02	0.0020	0.003	0.015	1.00	1.00	3.01E+01	3.80E-03	3.02E+01
American Robin												
Chromium	6.69E+02	0.338	2.26E+02	1.90E-02	0.0094	0.011	0.077	1.00	1.00	2.76E+01	2.71E-03	2.76E+01
Vanadium	5.07E+02	0.361	1.83E+02	3.86E-02	0.0094	0.011	0.077	1.00	1.00	2.23E+01	5.51E-03	2.23E+01

Notes:

1 Mean and mean UCL surface soil concentrations from Hudson Branch wetland (see Table B-6).

2 BAFs from regression analyses as discussed in Section 3.2.3 (chromium BAF = 0.338 and vanadium BAF = 0.361).

3 Mean and mean UCL terrestrail invertebrate concentrations calculated by multiplying surface soil concentration by BAF.

4 Mean and mean UCL surface water concentrations from Table B-1.

5 from Table 4-15.

6 Mean or mean UCL terrestrial invertebrate concentration * food ingestion rate * area use factor * temporal use factor divided by body weight.

7 Mean or mean UCL surface water concentration * surface water ingestion rate * area use factor * temporal use factor divided by body weight.

8 Sum of mean or mean UCL terrestrial invertebrate and surface water exposure doses.

Table 4-18
Terrestrial Wildlife Receptors Mean UCL and Mean Risk Characterization - Eastern Storage Areas and Hudson Branch Wetland
SMC Superfund Site
Newfield, New Jersey

Surface Soil COPEC	Avian MATC TRV (mg/kg-BW/day) [1]	Mammalian MATC TRV (mg/kg-BW/day) [2]	Eastern Storage Areas		Hudson Branch Wetlands		Eastern Storage Areas		Hudson Branch Wetlands	
			Mean UCL Shrew Dose (mg/kg/BW-day) [3]	Mean UCL Robin Dose (mg/kg/BW-day) [3]	Mean UCL Shrew Dose (mg/kg/BW-day) [4]	Mean UCL Robin Dose (mg/kg/BW-day) [4]	Mean UCL Shrew MATC HQ[5]	Mean UCL Robin MATC HQ[5]	Mean UCL Shrew MATC HQ[5]	Mean UCL Robin MATC HQ[5]
Chromium	6.46	11.8	3.82E+01	3.50E+01	8.65E+01	7.92E+01	3E+00	5E+00	7E+00	1.2E+01
Vanadium	1.42	7.48	6.23E+01	5.70E+01	NRP	7.17E+01	8E+00	4.0E+01	-	5.0E+01
						Total Hazard Index	1.2E+01	4.6E+01	7E+00	6.3.E+01
Surface Soil COPEC	**Avian MATC TRV (mg/kg-BW/day) [1]**	**Mammalian MATC TRV (mg/kg-BW/day) [2]**	**Mean UCL Shrew Dose (mg/kg/BW-day) [3]**	**Mean UCL Robin Dose (mg/kg/BW-day) [3]**	**Mean UCL Shrew Dose (mg/kg/BW-day) [4]**	**Mean UCL Robin Dose (mg/kg/BW-day) [4]**	**Mean Shrew MATC HQ[5]**	**Mean Robin MATC HQ[5]**	**Mean Shrew MATC HQ[5]**	**Mean Robin MATC HQ[5]**
Chromium	6.46	11.8	2.57E+01	2.35E+01	3.02E+01	2.76E+01	2E+00	4E+00	3E+00	4E+00
Vanadium	1.42	7.48	2.98E+01	2.73E+01	NRP	2.23E+01	4E+00	1.9E+01	-	1.6E+01
						Total Hazard Index	6E+00	2.3E+01	3E+00	2.0E+01

Notes:

[1] Avian MATC TRVs from Table 4-13 (applies to American robin).

[2] Mammalian MATC TRVs from Table 4-13 (applies to short-tailed shrew).

[3] Mean UCL and mean eastern storage areas exposure doses from Table 4-16.

[4] Mean UCL and mean Hudson Branch wetland exposure doses from Table 4-17.

[5] HQ (Hazard Quotient) = Mean or Mean UCL exposure dose / TRV.

NRP - No risk predicted (not at risk based on results of SLERA).

Table 5-1
BERA Risk Summary
SMC Superfund Site
Newfield, New Jersey

Evaluation Area/Receptor	COPEC Risk Drivers	Conclusions/Comments
Hudson Branch		
	Chromium	77% sediment samples > PEC.
	Copper	18% sediment samples > PEC.
	Lead	23% sediment samples > PEC.
	Nickel	51% sediment samples > PEC.
	Vanadium	62% dissolved surface water samples > Tier II Secondary Chronic Value. No sediment criteria available.
Mammalian Herbivores	Chromium	Mean exposure dose > MATC TRV but < LOAEL TRV.
Avian Herbivores	Chromium	Mean exposure dose > MATC TRV and > LOAEL TRV.
Mammalian Insectivores	Chromium, Vanadium	Mean vanadium exposure dose > MATC TRV and LOAEL TRV. Mean chromium exposure dose > MATC but < LOAEL TRV.
Avian Insectivores	Chromium, Vanadium	Mean exposure doses > MATC TRV and > LOAEL TRV.
Eastern Storage Areas		
Terrestrial Plant Community	None	Surface soil concentrations of manganese, nickel and vanadium detected > plant TRVs in > 20% samples but no phytotoxicity indicators.
Avian Insectivores	Chromium, Vanadium	Mean exposure doses > MATC TRV and > LOAEL TRV.
Mammalian Insectivores	Chromium, Vanadium	Mean vanadium exposure dose > MATC TRV and LOAEL TRV. Mean chromium exposure dose > MATC but < LOAEL TRV.
Southern Area		
Terrestrial Plant Community	None	Surface soil concentrations of vanadium detected > plant TRVs in > 20% of samples but no phytotoxicity indicators.
Hudson Branch Wetland		
Terrestrial Plant Community	Chromium, Nickel, Vanadium	Surface soil concentrations of nickel and vanadium detected > plant TRVs in > 20% samples with possible phytotoxicity indicators. No chromium TRV available.
Avian Insectivores	Chromium, Vanadium	Mean exposure doses > MATC TRV and > LOAEL TRV.
Mammalian Insectivores	Chromium	Mean exposure dose > MATC TRV but < LOAEL TRV.

Table 5-2
Toxicity Test Results and Sediment Potential PRGs
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	**Sediment PEC TRV (mg/kg)** [1]	**Hudson Branch Samples**						
		SD-10	**SD-13**	**SD-15**	**SD-18**	**SD-04**	**SD-23**	**Potential PRG**
Toxicity Test Parameters								
Survival (Percent)								
28 Days	-	87.5	100.0	88.8	2.5*	98.8	96.3	-
35 Days	-	85.0	97.5	87.5	2.5*	98.8	96.3	-
42 Days	-	83.8	96.3	83.8	1.3*	96.4	95.0	-
Growth (mg) - 42 days	-	0.35	0.36	0.37	0.40	0.33	0.37	-
Reproduction (neonates/female)	-	2.85	3.37	3.64	0.0*	2.62	4.37	-
Sediment Chemistry Analysis (mg/kg) [2]								
Chromium	111	**473**	**6295**	**2890**	**2580**	**630**	**500**	**1275**
Copper	149	66.0	**223**	118	81.1	30.1	13.8	**223**
Lead	128	48.4	**303**	70.5	107	33.4	13.2	**303**
Nickel	48.6	**50.6**	**193**	**239**	**158**	**73.1**	16.4	**107**
Vanadium	NA	203	945	**554**	**595**	176	93	574

Notes:

* Result is statistically significant from control sample and reference area samples.

Sediment concentrations in **red** exceed their PEC TRV and represent the LOAEL.

Sediment concentrations in **green** represent the NOAEL.

Sediment concentrations in **bold** exceed their PEC TRV.

[1] Sediment PEC TRVs identified in Table 4-5.

[2] Sediment concentrations from Table A-3.

Table 5-3
Risk-Based Sediment Preliminary Remediation Goals
SMC Superfund Site
Newfield, New Jersey

Sediment COPEC	Mean Sediment Concentration (mg/kg) [1]	Benthic Community Proposed PRG (mg/kg)[2]	Wildlife Potential PRGs (mg/kg)[3]							
			Muskrat		Mallard		Little Brown Bat		Tree Swallow	
			LOAEL	MATC	LOAEL	MATC	LOAEL	MATC	LOAEL	MATC
Chromium	1923	**1275**	6190	1250	1400	578	5930	1200	616	254
Copper	76.8	**223**	NA	NA	NA	NA	NA	NA	NA	NA
Lead	83.6	**303**	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	136	**107**	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	486	**574**	NA	NA	NA	NA	102.0	80.3	7.10	5.86

Notes:

Values in bold represent proposed preliminary remediation goals (PRGs).

[1] Mean sediment concentrations from aquatic habitat area (see Table B-3).

[2] Based on toxicity test results from the Hudson Branch sediment samples (see Table 5-2).

[3] Sediment concentration resulting in HQ of 1 for MATC or LOAEL TRV (see Section 5.2.1.2)

Table 5-4
Risk-Based Surface Soil Preliminary Remediation Goals
SMC Superfund Site
Newfield, New Jersey

Surface Soil COPEC	Mean Surface Soil Concentration (mg/kg) [1]	Wildlife Potential PRGs (mg/kg) [2]			
		Short-Tailed Shrew		American Robin	
		LOAEL	MATC	LOAEL	MATC
Eastern Storage Areas					
Chromium	162	366	74.0	108	**44.4**
Vanadium	1017	322	255	63.0	**52.5**
Hudson Branch Wetland					
Chromium	669	1290	261	380	**157**
Vanadium	507	NA	NA	39.0	**32.0**

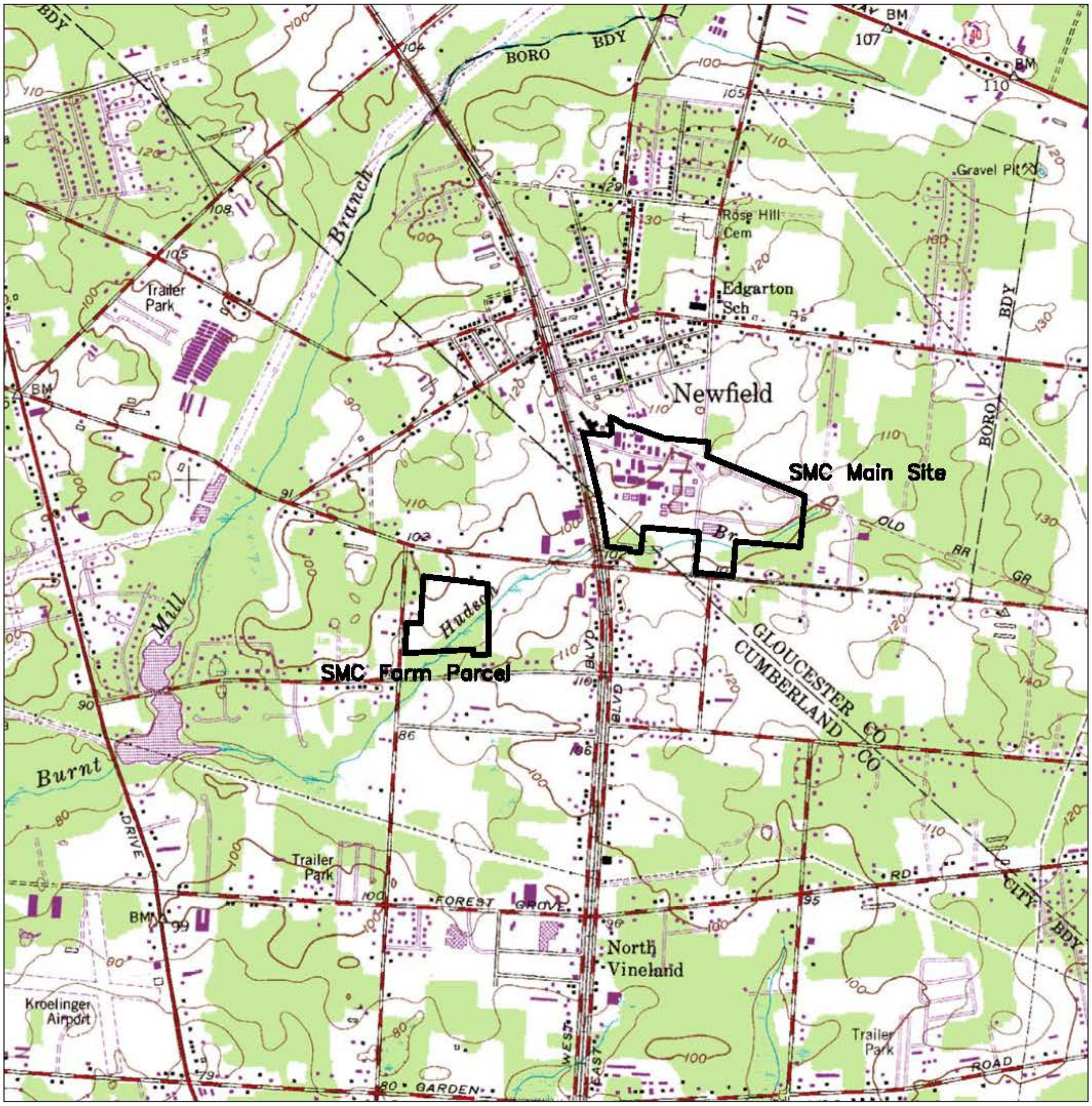
Notes:

Values in bold represent proposed preliminary remediation goals (PRGs).

[1] Mean surface soil concentrations from terrestrial habitat area (see Tables B-5 and B-6).

[2] Surface soil concentration resulting in HQ of 1 for MATC and LOAEL TRVs (see Sections 5.2.2 and 5.2.3)

FIGURES



SOURCE: NEWFIELD, N.J. QUADRANGLE, 1953, PHOTOREVISED 1994, 7.5 MINUTE SERIES (USGS TOPOGRAPHIC MAP)

SITE PROPERTY BOUNDARY

N

0 2000 FT.

APPROXIMATE SCALE

NEW JERSEY

QUADRANGLE LOCATION

TRC ENVIRONMENTAL CORP.
57 East Willow Street
Millburn, New Jersey 07041

SITE LOCATION MAP

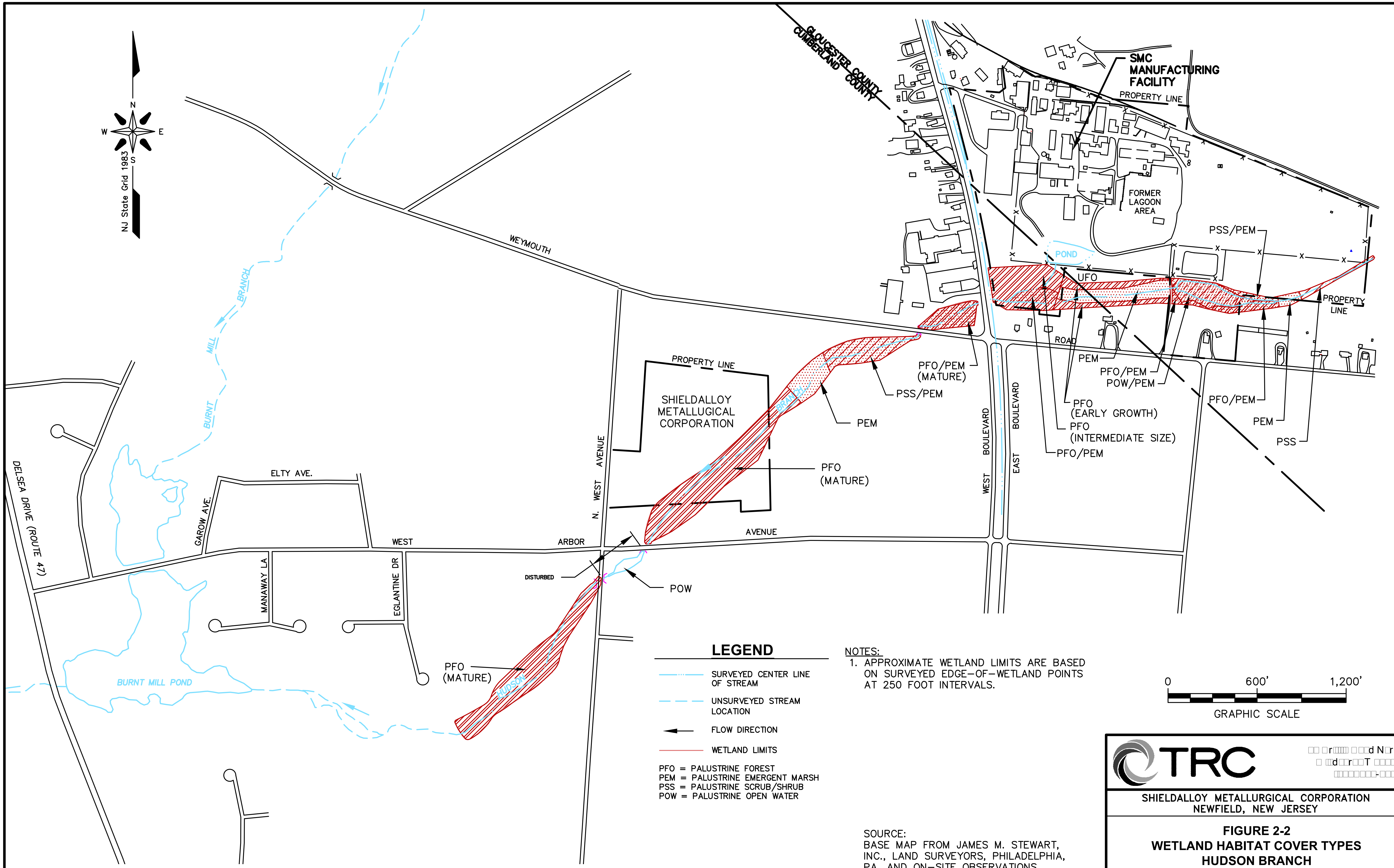
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NO.: 2710ES-112434

YK/ODL	DATE: FEB 2013	FIGURE: 1

Q:\GEOSCI\GISKEYPROJECTS\SMC\FEB 2013\SITE LOCATION MAP_FEB2013.DWG 02/21/2013 02:34:34PM TAB: LAYOUT

R2-0001591



TRC

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE 2-2
WETLAND HABITAT COVER TYPES
HUDSON BRANCH

Date: 02/13 | **Project No.** 112434-00SEDI-002690

J:\CAD\112434\00SEDI\002690\
Figure 2-2.dwg Layout:FIGURE 2-2 February 27, 2013-8:35AM KHollenbeck

R2-0001592

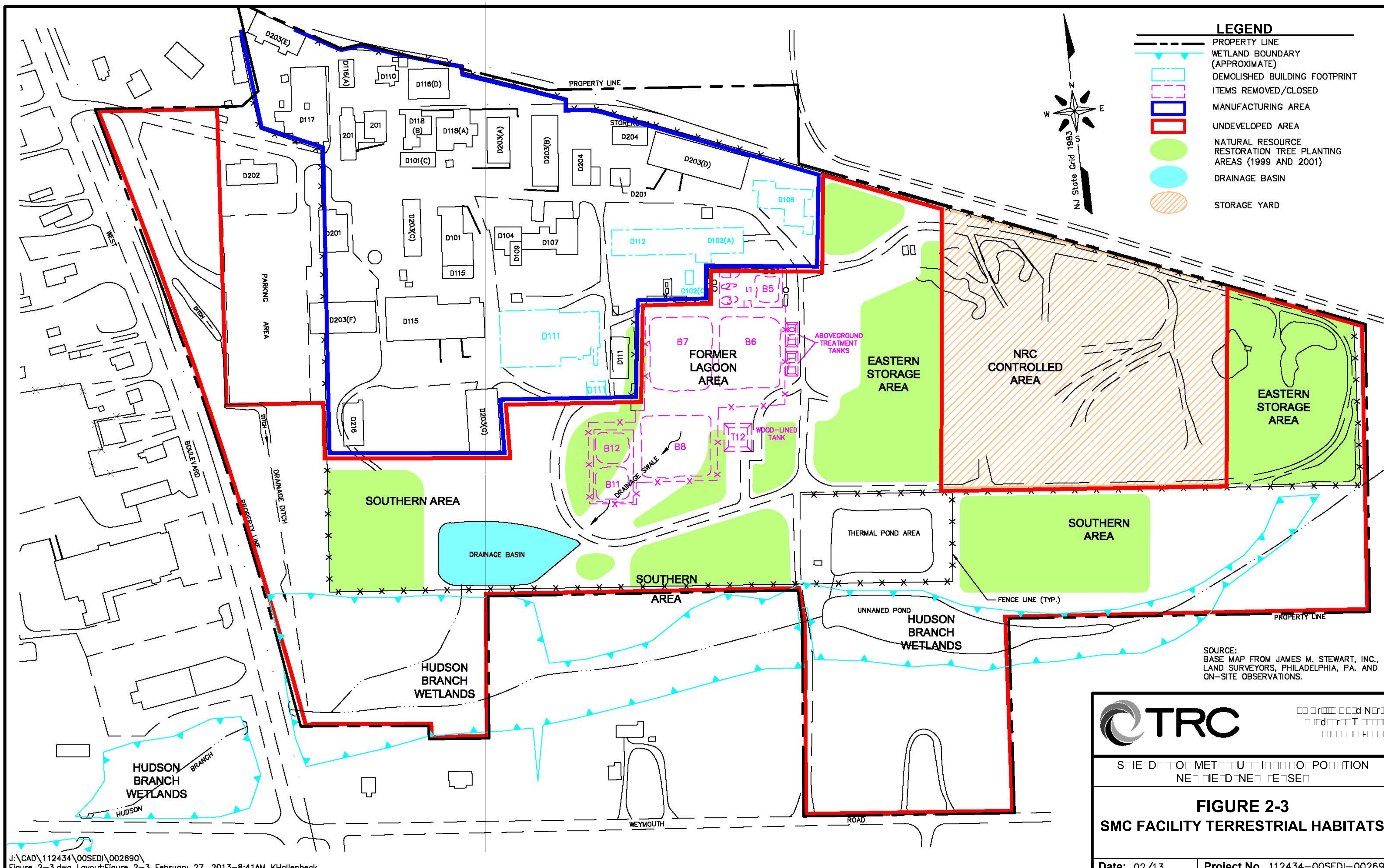
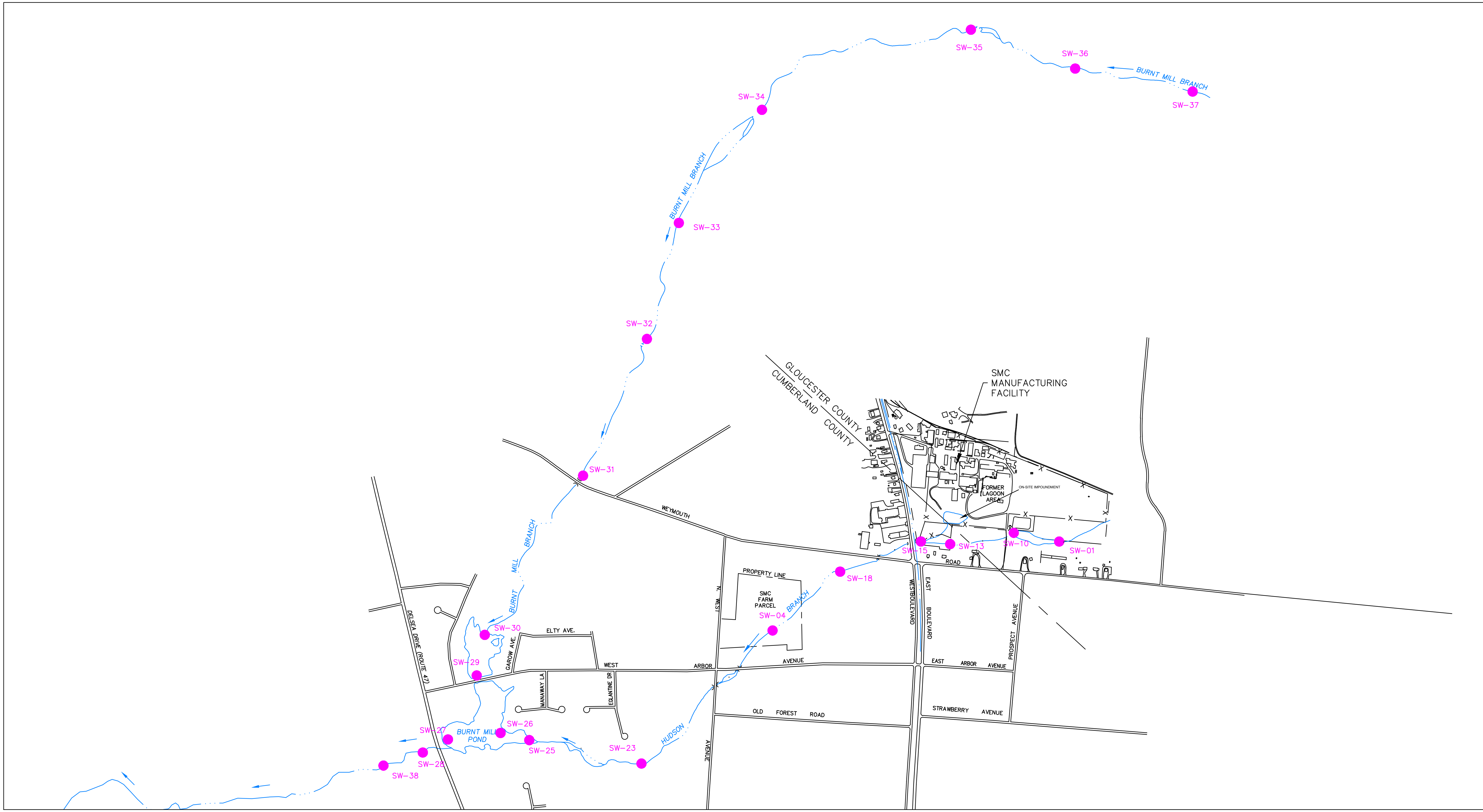


FIGURE 2-3
SMC FACILITY TERRESTRIAL HABITATS

Date: 02/13 Project No. 112434-00SEDI-002690



LEGEND

PROPERTY LINE

● 2011 SURFACE WATER SAMPLES

SOURCE:
BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.

LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.

ORTHOPHOTOS FROM NEW JERSEY IMAGE WAREHOUSE WEB SITE, PUBLISHED 7/31/2003 WITH PHOTO TAKEN IN 2002.

0 1250' 2500'

GRAPHIC SCALE

TRC ENVIRONMENTAL CORP.
1500 Market Street
Philadelphia, PA 19102

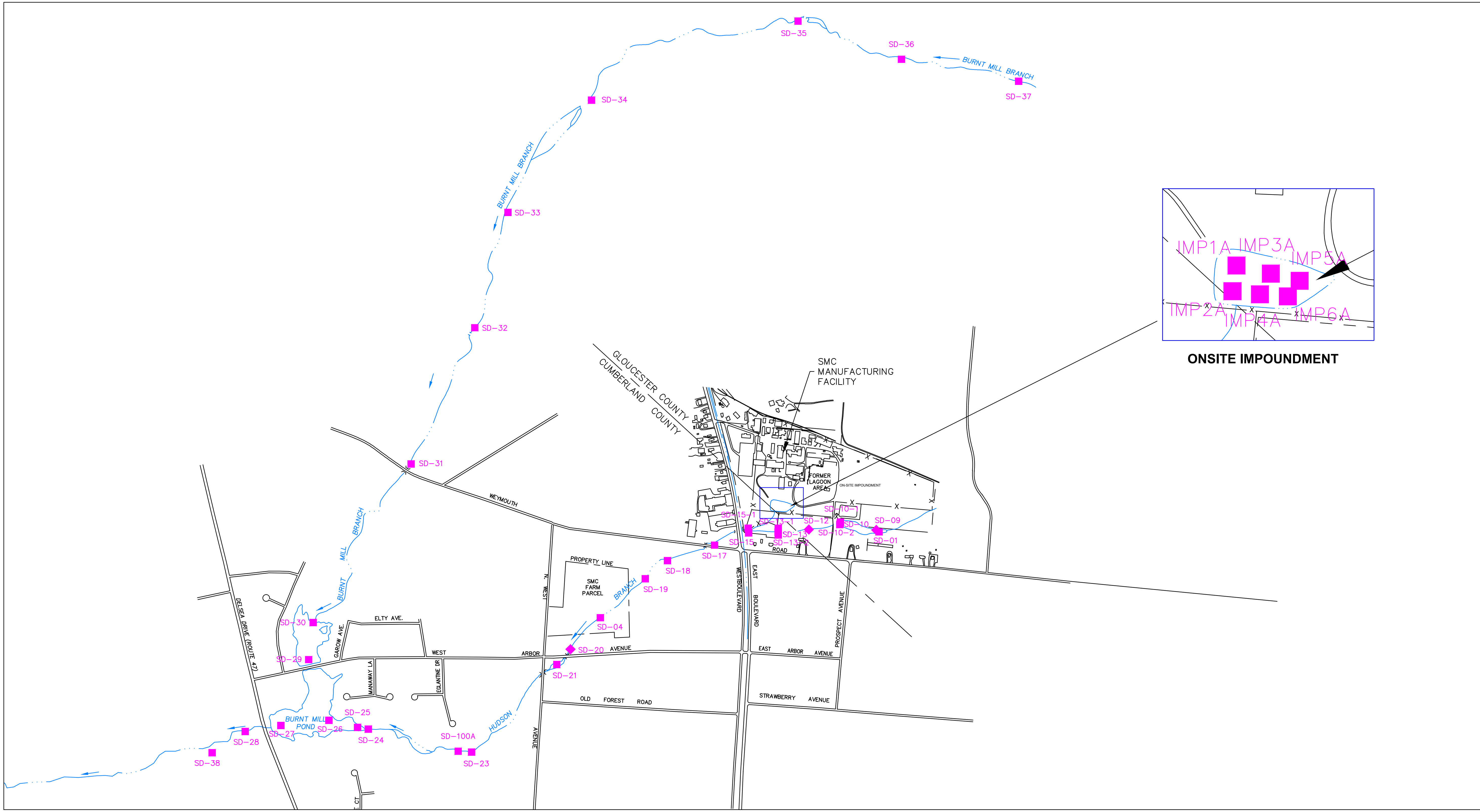
SURFACE WATER SAMPLING LOCATIONS (2011)

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NUMBER: 112434

PZ/SH	DATE: FEBRUARY 2013	FIGURE: 2-4

R2-0001594



LEGEND

PROPERTY LINE

◆ 2009 SEDIMENT SAMPLE LOCATION

■ 2011 SEDIMENT SAMPLE LOCATION

0 1250' 2500'

GRAPHIC SCALE

SOURCE:
BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.

LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.

ORTHOPHOTOS FROM NEW JERSEY IMAGE WAREHOUSE WEB SITE, PUBLISHED 7/31/2003 WITH PHOTO TAKEN IN 2002.

FILE: Q:\GEOSCI\GISKEYPROJECTS\SMC\SMC_NEW SEDIMENT LOCATIONS_FEB2013.DWG, DATE: 02/21/2013 02:56:04PM

TRC ENVIRONMENTAL CORP.
1500 Market Street
Philadelphia, PA 19102

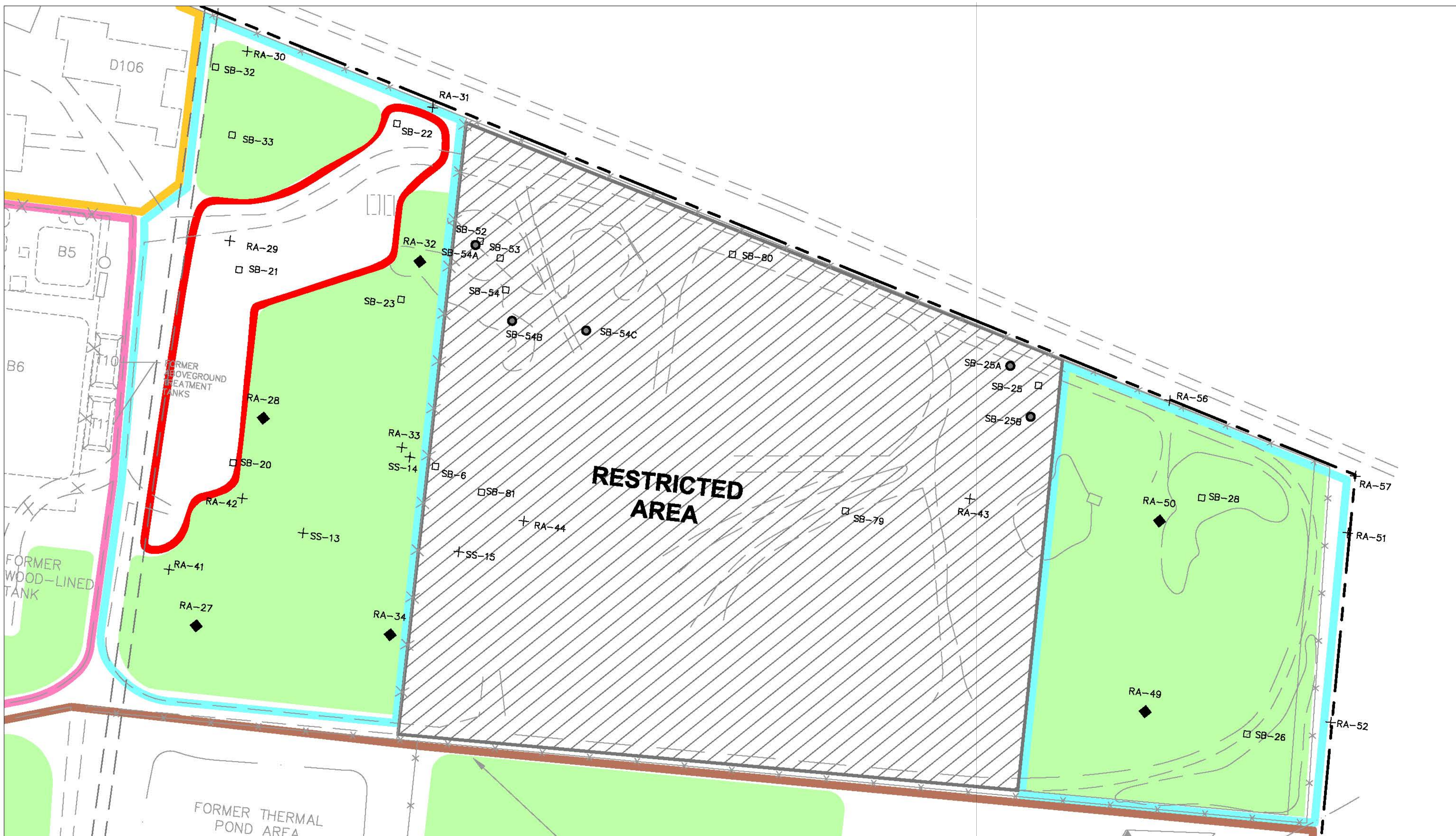
SEDIMENT SAMPLING LOCATIONS
(2009 AND 2011)

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NUMBER: 112434

PZ/SH	DATE: FEBRUARY 2013	FIGURE: 2-5

R2-0001595



LEGEND

PROPERTY LINE
SOIL BORING LOCATION
SURFACE SOIL SAMPLE LOCATION
2011 SAMPLE LOCATION

SOURCE:
BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.

LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.

ORTHOPHOTOS FROM NEW JERSEY IMAGE WAREHOUSE WEB SITE, PUBLISHED 7/31/2003 WITH PHOTO TAKEN IN 2002.

0 100' 200'
GRAPHIC SCALE

TRC ENVIRONMENTAL CORP.
1500 Market Street
Philadelphia, PA 19102

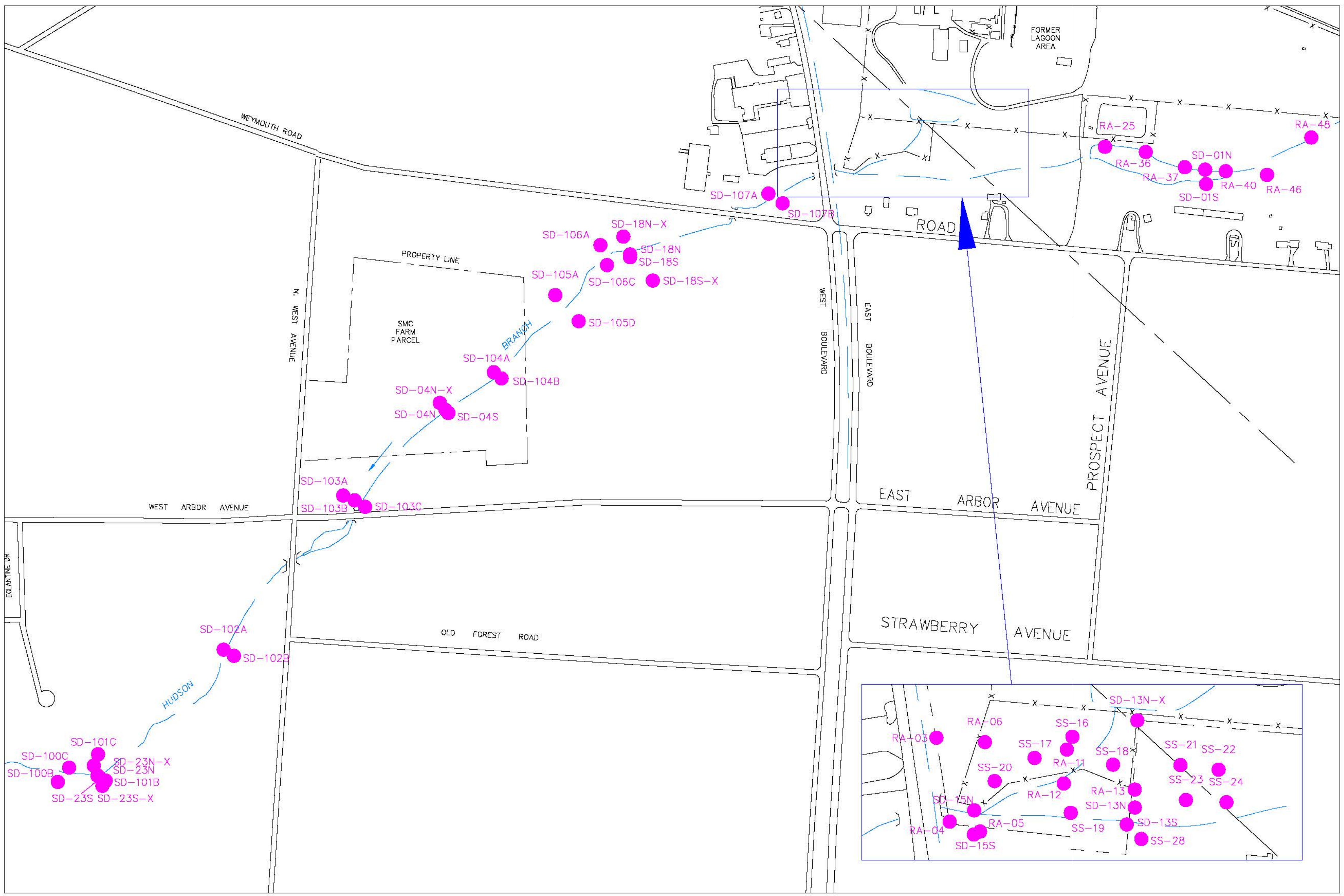
SURFACE SOIL SAMPLING LOCATIONS
(EATERN STORAGE AREA)

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NUMBER: 112434

PZ/SH | DATE: FEBRUARY 2013 | FIGURE: 2-6

R2-0001596



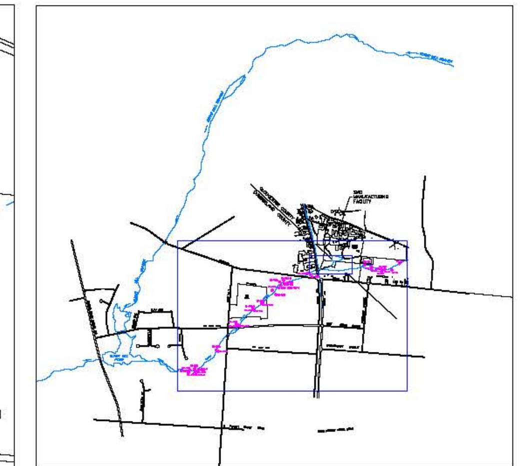


FIGURE LOCATION PLAN

LEGEND

PROPERTY LINE

SURFACE SOIL SAMPLE LOCATION

0 500' 1000'

GRAPHIC SCALE

SOURCE:
BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.

LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.

ORTHOPHOTOS FROM NEW JERSEY IMAGE WAREHOUSE WEB SITE, PUBLISHED 7/31/2003 WITH PHOTO TAKEN IN 2002.

FILE: Q:\GEOSCI\GISKEYPROJECTS\SMC\SMC_HUDSON_BRANCH_WETLAND_SAMPLE LOCATIONS_FEB2013.DWG, DATE: 02/21/2013 03:00:10PM

TRC ENVIRONMENTAL CORP.
1500 Market Street
Philadelphia, PA 19102

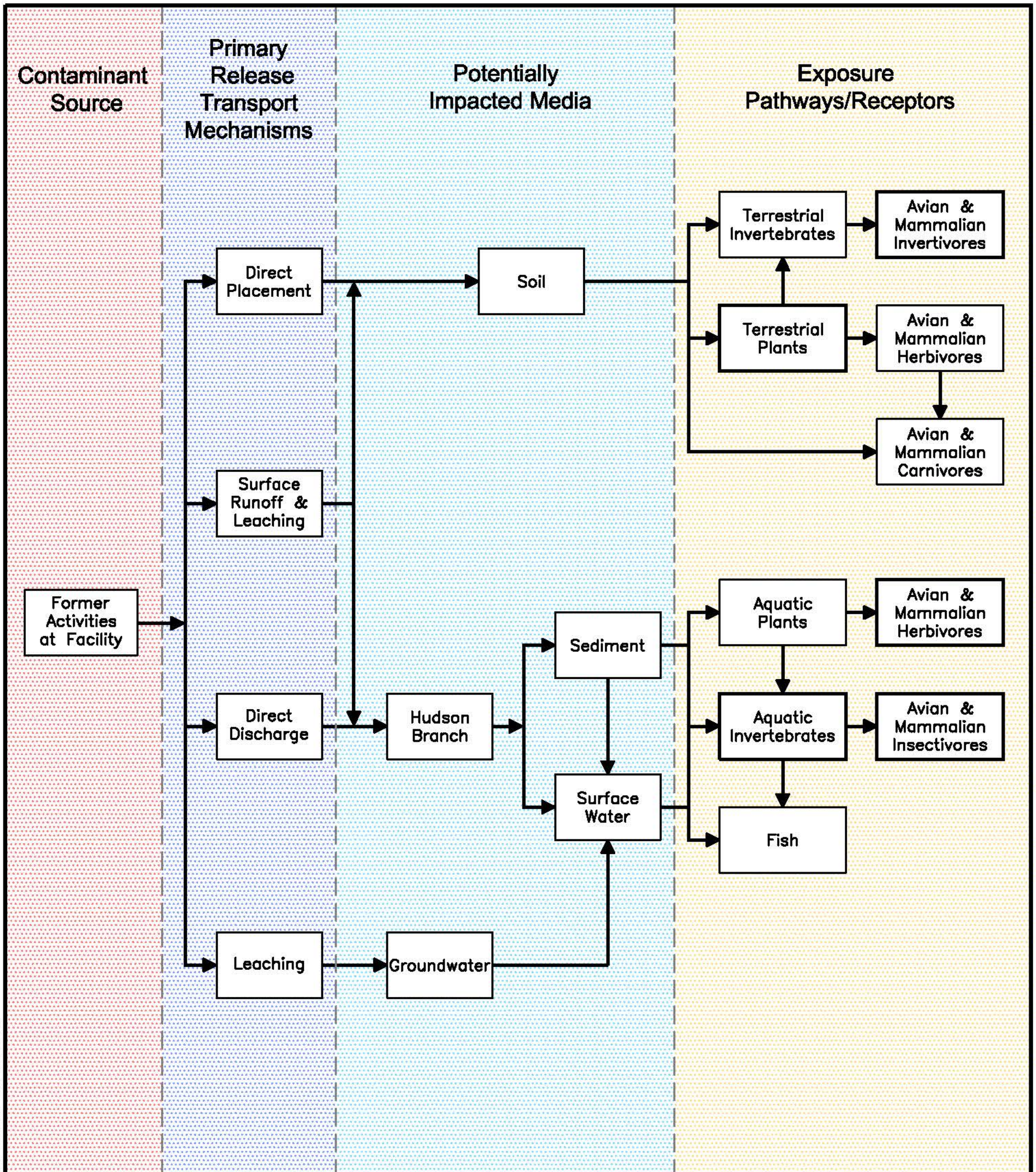
SURFACE SOIL SAMPLING LOCATIONS
(HUDSON BRANCH WETLAND – 1990 THROUGH 2012)

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NUMBER: 112434

PZ/SH	DATE: FEBRUARY 2013	FIGURE: 2-7

R2-0001597



KEY

Assessment Endpoint for BERA

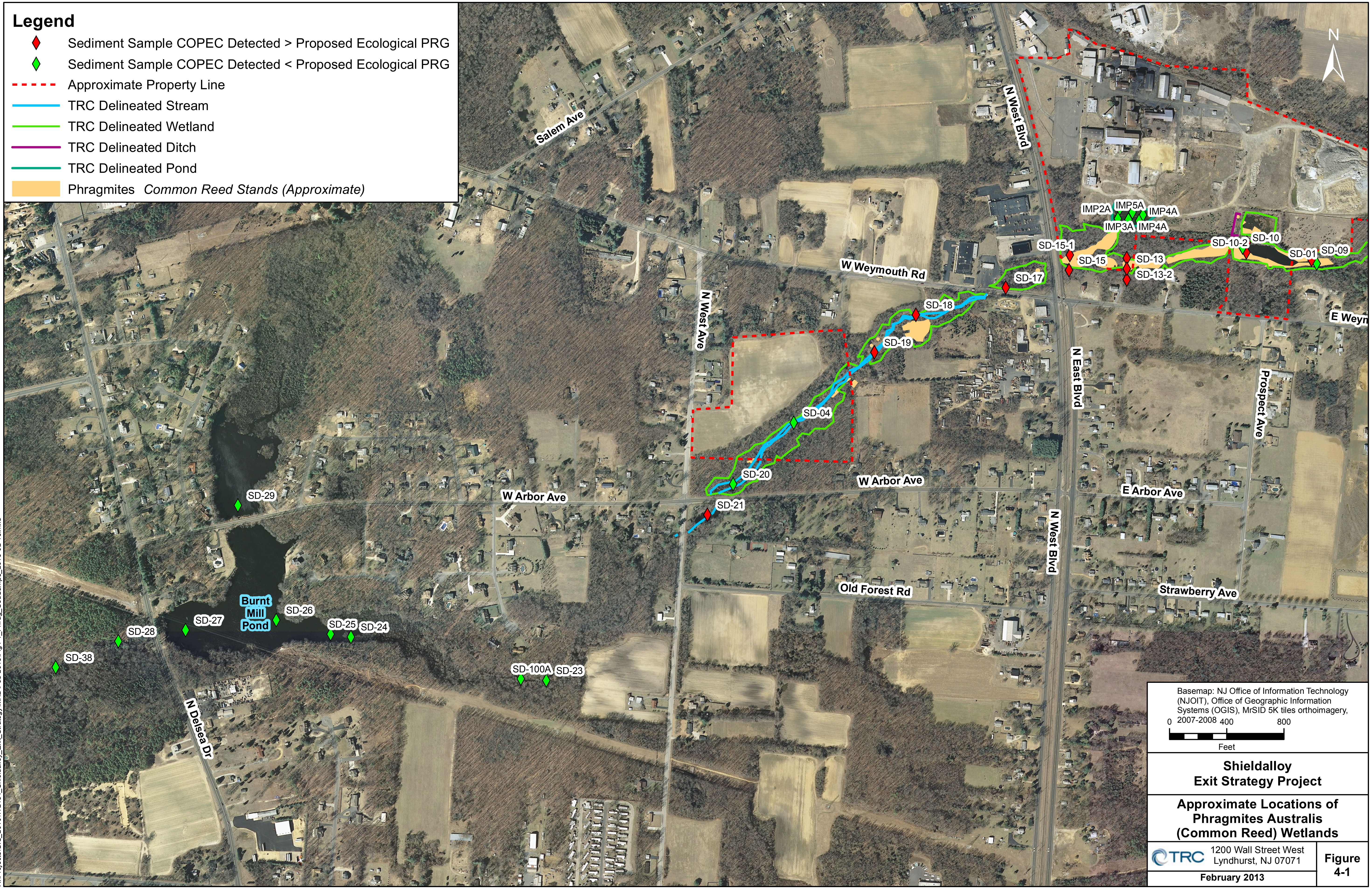
TRC
21 Griffin Road North
Windsor, CT 06095
860.298.9692

SMC Superfund Site
Newfield, NJ

Figure 2-8 Ecological Conceptual Site Model Significant Exposure Pathways

Date: February 2013 | Project No. 112434

FILE: G:\GEOSCI\GISKEYProjects\SMC\ECO CONCEPT SITE MODEL.dwg



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R2-0001599

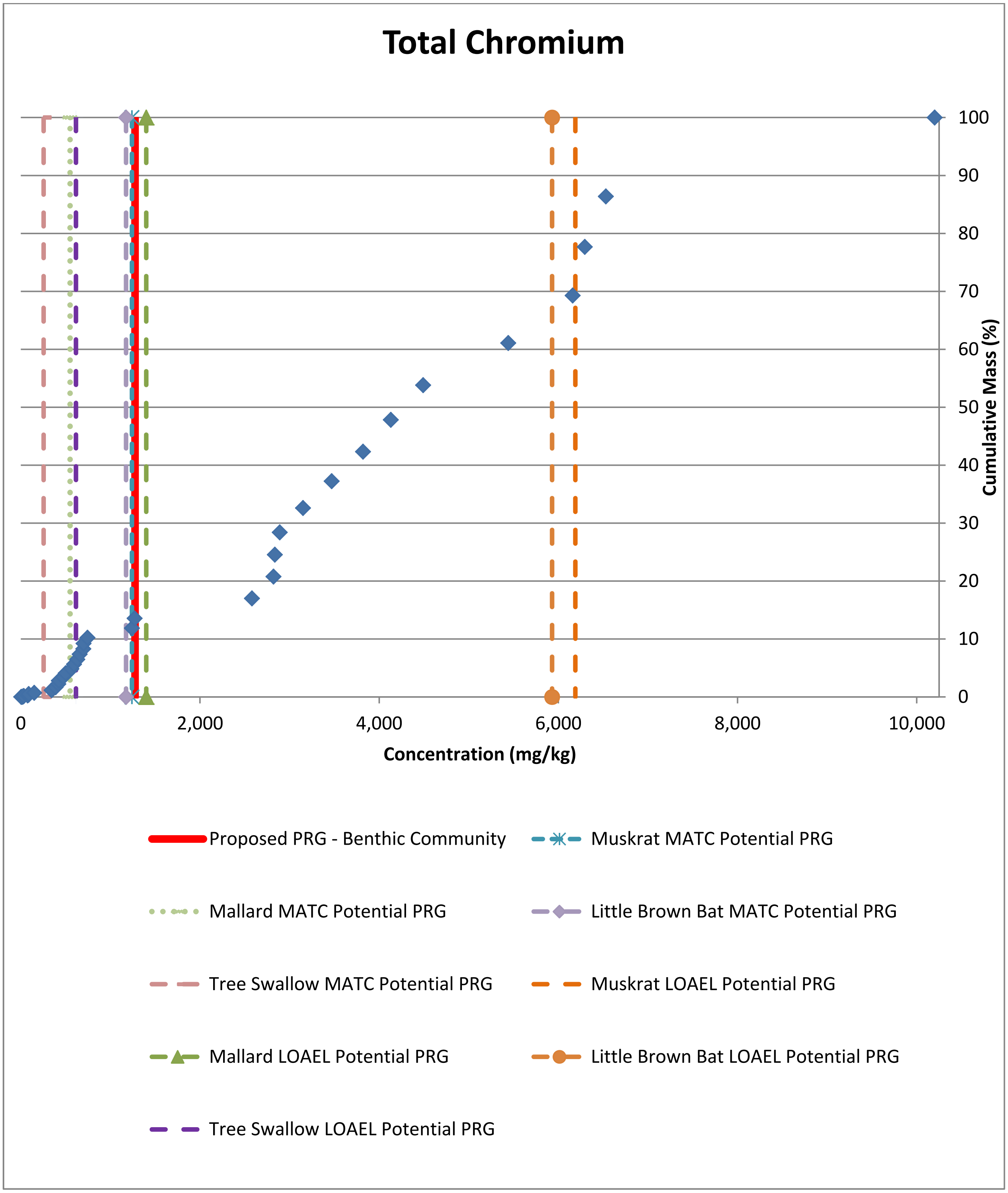


Figure 5-1. Chromium Distribution and PRGs in Hudson Branch Sediment.

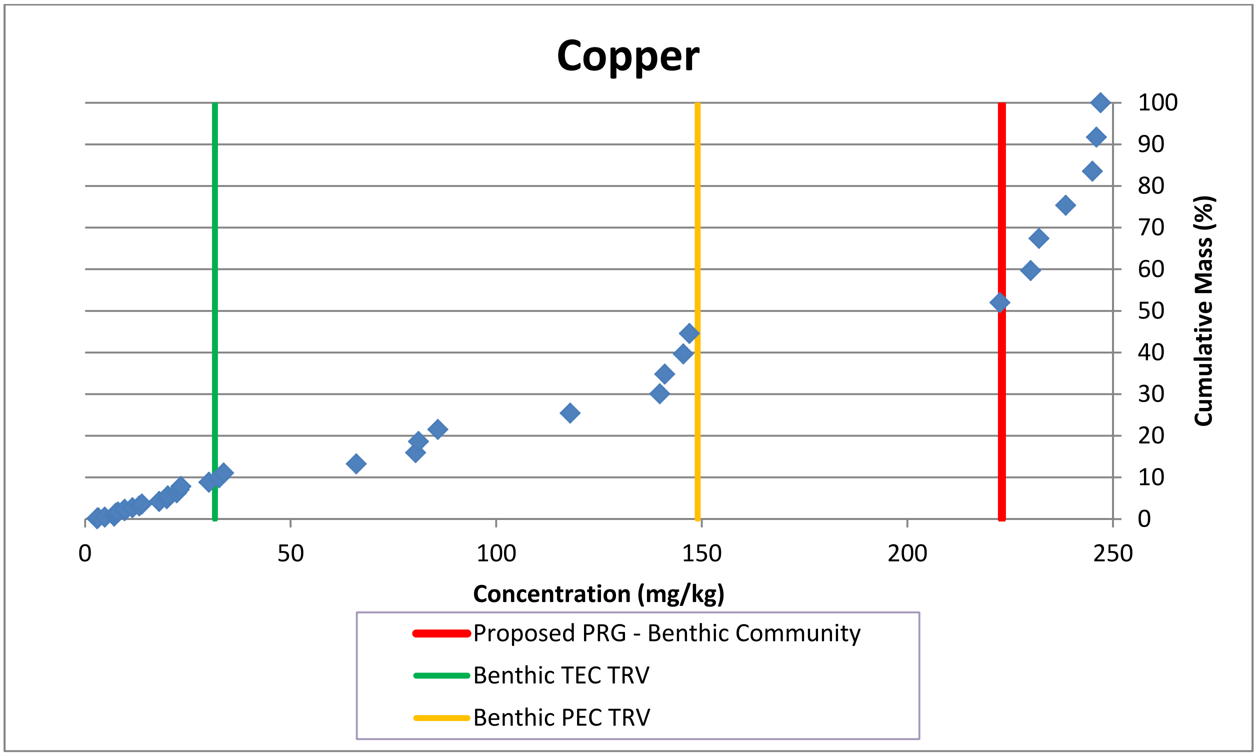


Figure 5-2. Copper Distribution and PRG in Hudson Branch Sediment.

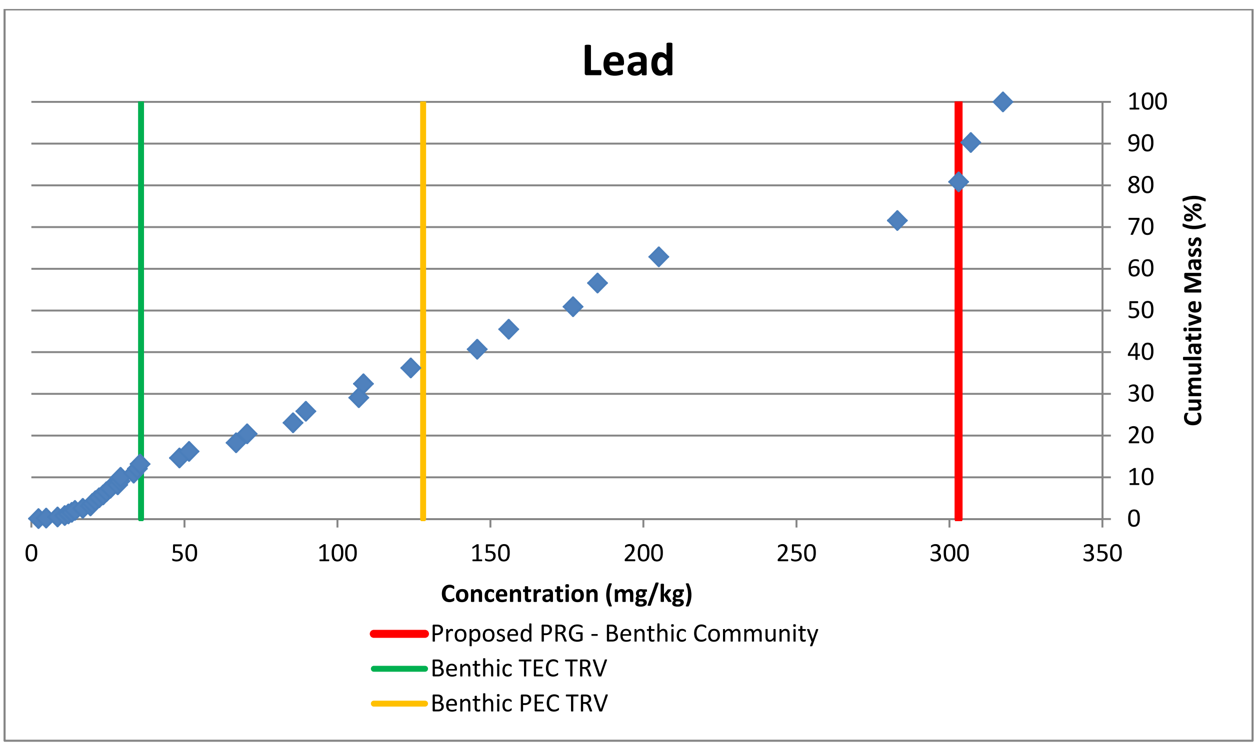


Figure 5-3. Lead Distribution and PRG in Hudson Branch Sediment.

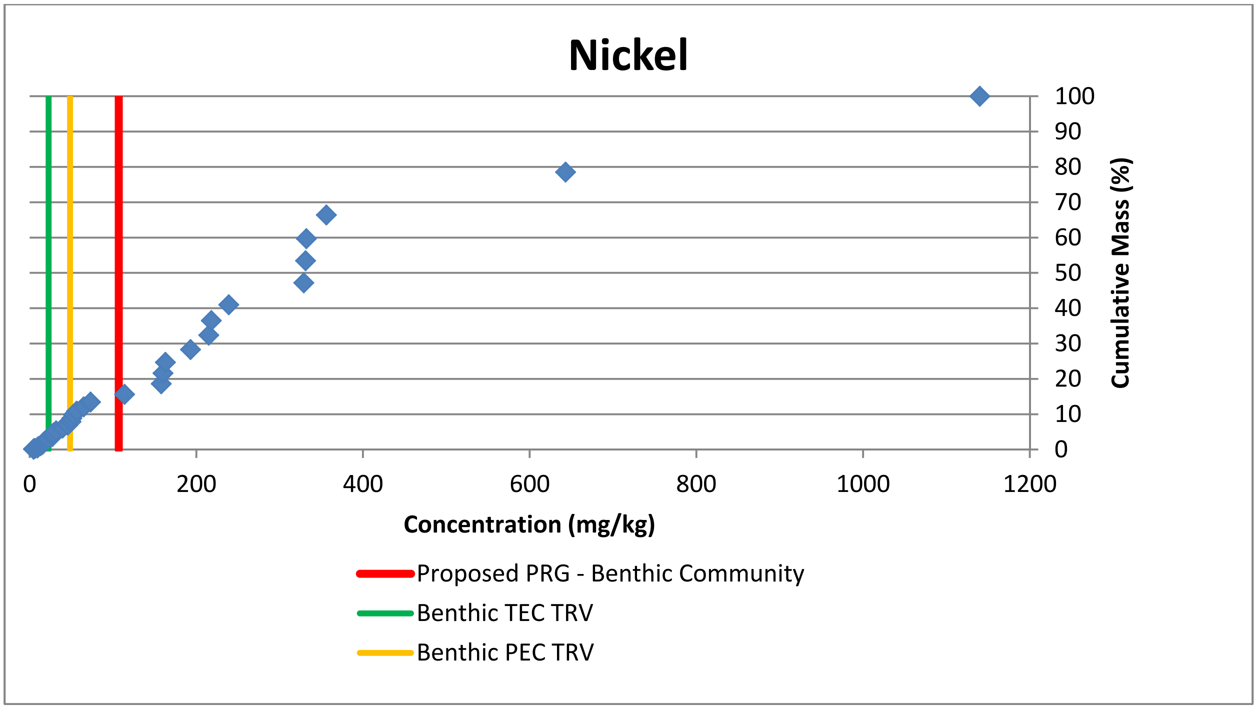


Figure 5-4. Nickel Distribution and PRG in Hudson Branch Sediment.

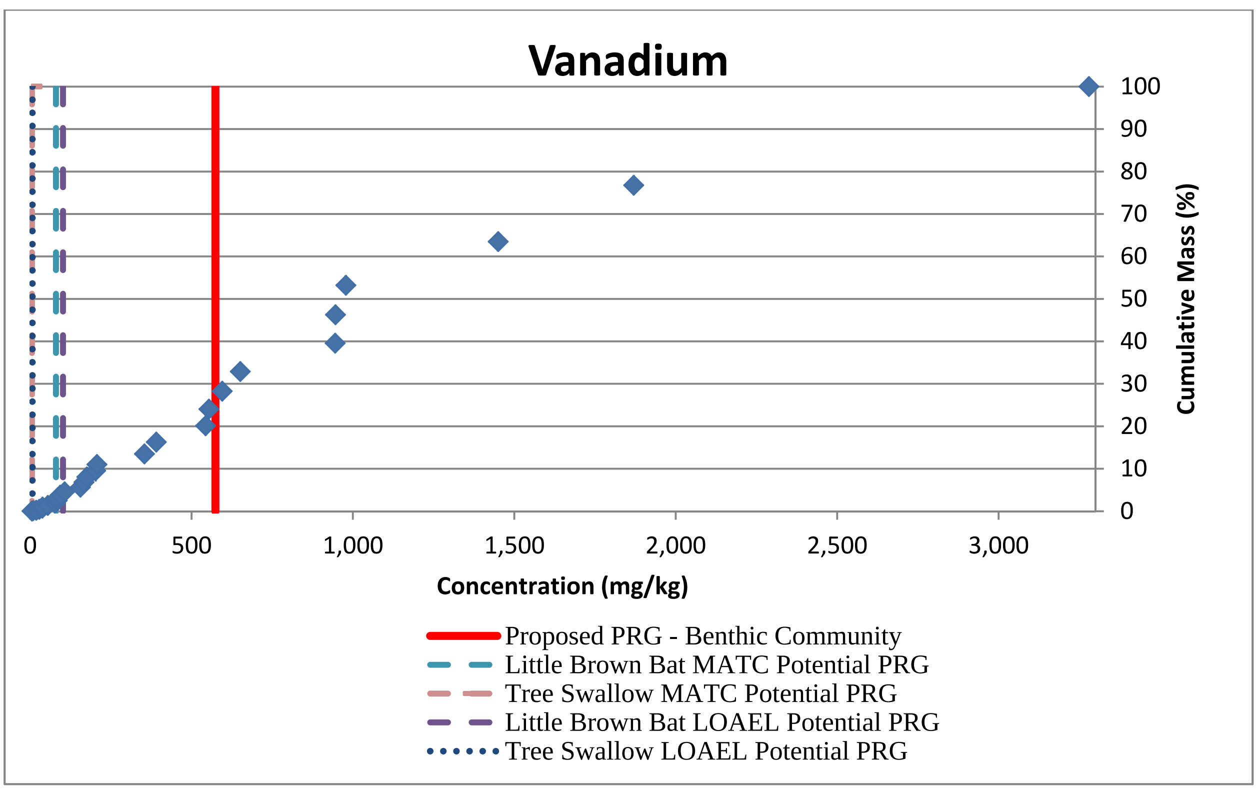
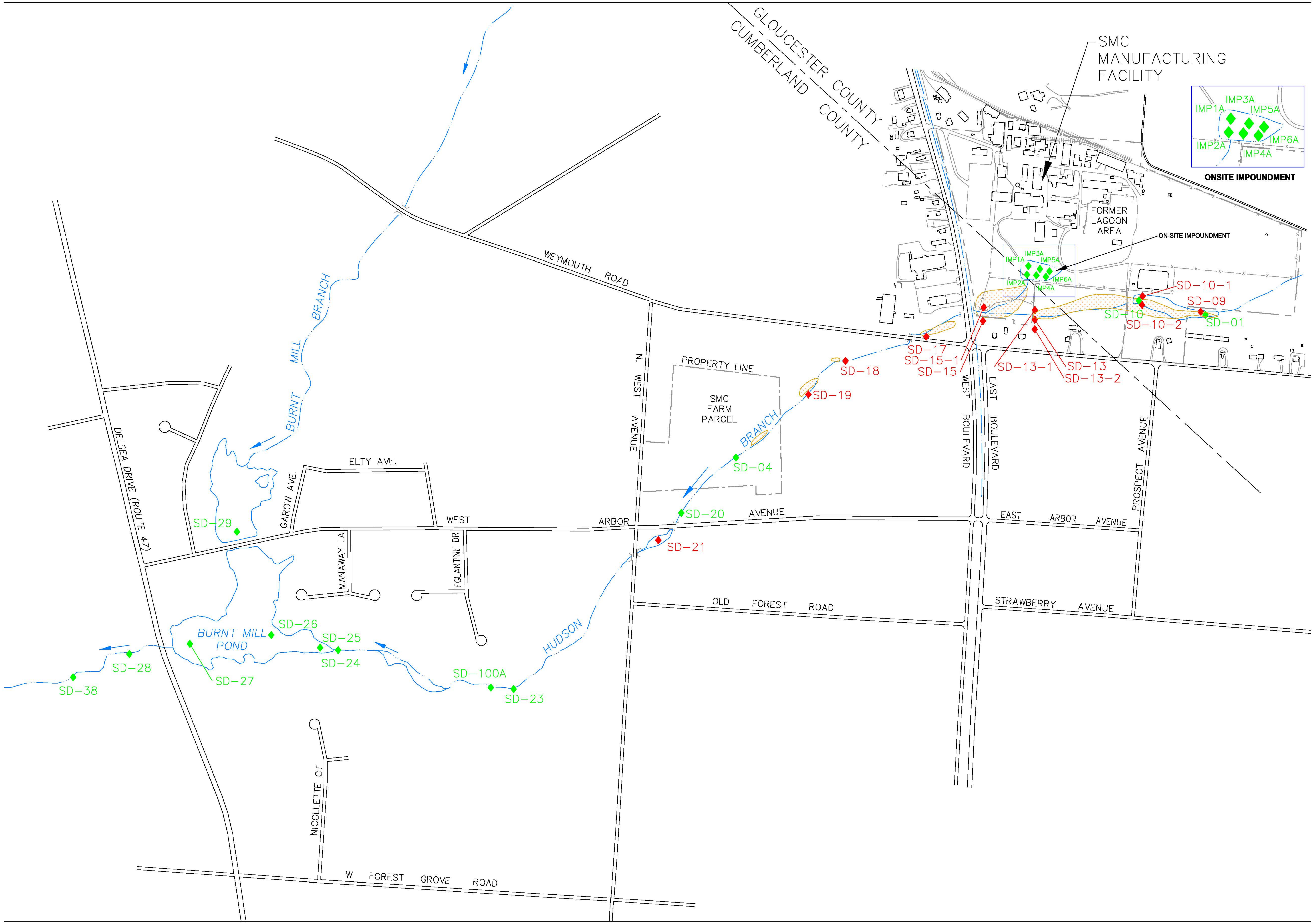


Figure 5-5. Vanadium Distribution and PRGs in Hudson Branch Sediment.



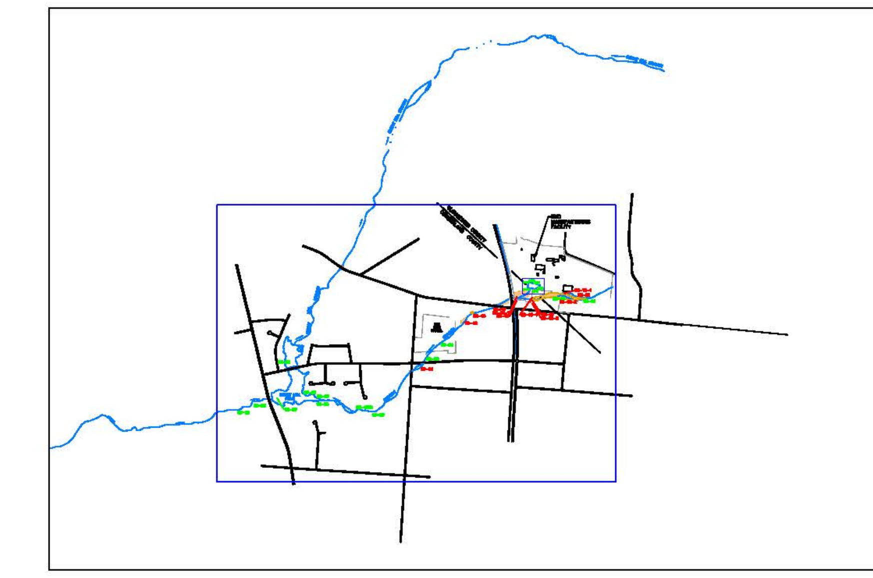


FIGURE LOCATION PLAN

LEGEND

PROPERTY LINE

SEDIMENT SAMPLE COPEC DETECTED > PROPOSED ECOLOGICAL PRG

SEDIMENT SAMPLE COPEC DETECTED < PROPOSED ECOLOGICAL PRG

COMMON REED STAND (APPROXIMATE)

SOURCE:
BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.

LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.

ORTHOPHOTOS FROM NEW JERSEY IMAGE WAREHOUSE WEB SITE, PUBLISHED 7/31/2003 WITH PHOTO TAKEN IN 2002.

0 400' 800'
GRAPHIC SCALE

TRC ENVIRONMENTAL CORP.
1500 Market Street
Philadelphia, PA 19102

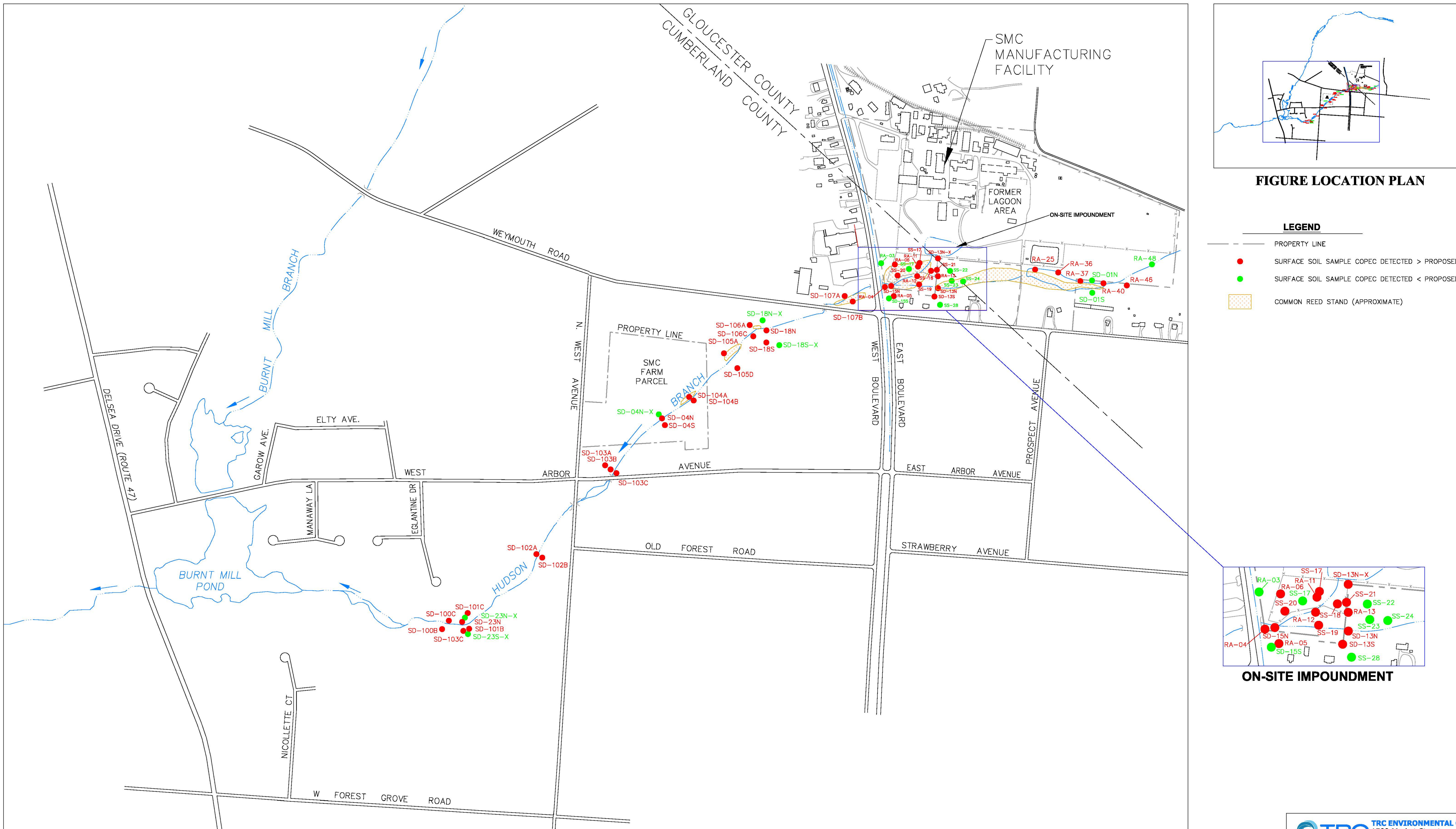
SEDIMENT SAMPLES EXCEEDING PROPOSED ECOLOGICAL PRGs

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NUMBER: 112434

HWB/SH	DATE: FEB 2013	FIGURE: 5-6

FILE: Q:\GEOSCI\GISKEYPROJECTS\SMC\FEB 2013\SMC_NEW SEDIMENT LOCATIONS_FEB2013- FIG 5-6.DWG, DATE: 02/21/2013 02:30:05PM



SOURCE:
BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.

LACROCE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.

ORTHOPHOTOS FROM NEW JERSEY IMAGE WAREHOUSE WEB SITE, PUBLISHED 7/31/2003 WITH PHOTO TAKEN IN 2002.

FILE: Q:\GEOSCI\GISKEYPROJECTS\SMC\FEB 2013\SMC_NEW SEDIMENT LOCATIONS_FEB2013-FIG 5-7.DWG, DATE: 02/21/2013 02:27:42PM

TRC ENVIRONMENTAL CORP.
1500 Market Street
Philadelphia, PA 19102

SURFACE SOIL SAMPLES
EXCEEDING PROPOSED ECOLOGICAL PRGs

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

JOB NUMBER: 112434

HWB/SH	DATE: FEB 2013	FIGURE: 5-7

R2-0001604

APPENDIX A
LABORATORY ANALYTICAL RESULTS

Table A-1
Summary of Analytical Results for Hudson Branch Surface Water Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Sample Location:	**SW-01**	**SW-04**	**SW-10**	**SW-13**	**SW-15**	**SW-18**	**SW-23**	**SW-25**	**SW-26**	**SW-27**	**SW28**	**SW-29**	**SW-38**
Analysis	Sample ID:	SW-01	SW-04	SW-10	SW-13	SW-15	SW-18	SW-23	SW-25	SW-26	SW-27	SW28	SW-29	SW-38
	Sample Date:	10/13/2011	10/6/2011	10/12/2011	10/11/2011	10/7/2011	10/7/2011	10/6/2011	10/5/2011	10/5/2011	10/5/2011	10/4/2011	10/5/2011	10/5/2011
VOCs														
	cis-1,2-Dichloroethene	**0.57 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA
	Methyl Tert Butyl Ether	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA	NA	NA
Metals, total														
(ug/L)	Aluminum	**239 J**	**84**	**222**	**95**	**90**	**74**	**96**	**127**	**88**	**83**	**97**	**107**	**100**
	Barium	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
	Calcium	5,000 U	**6,720**	**5,300**	**9,350**	**6,305**	**7,400**	**8,360**	**8,670**	**8,820**	**10,000**	**8,900**	**9,480**	**9,110**
	Chromium (total)	**32.9 J**	**15.8**	**35.6**	**42.0**	**14.6**	**16.1**	**16.1**	**19.3**	**17.1**	10 U	10 U	10 U	10 U
	Cobalt	**0.95 J**	**0.80**	**0.30**	**7.7**	**0.85**	**0.70**	**0.60**	**0.30**	**0.30**	**1.4**	**2.2**	**4.1**	**2.1**
	Copper	**5.0 J**	**5.0**	**5.0**	**8.0**	**5.0**	**5.0**	**5.0**	**5.0**	**4.0**	**1.0**	**1.0**	1.0 U	**1.0**
	Iron	**2,200 J**	**645**	**3,460**	**2,750**	**499.5**	**641**	**700**	**653**	**551**	**297**	**396**	**373**	**658**
	Lead	**3.8 J**	3.0 U	**3.5**	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
	Magnesium	**10,080**	5,000 U	**6,810**	**6,530**	5,000 U	5,110	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U
	Manganese	**516 J**	**113**	**74.4**	**1,160**	**158**	**172**	**104**	**63.2**	**17.1**	**53.5**	**78.8**	**138**	**83**
	Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
	Nickel	**11.15 J**	10 U	10 U	**24.6**	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Potassium	**10,650**	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U
	Sodium	**30,200 J**	**79,100**	**35,200**	**48,100**	**94,350**	**92,900**	**85,300**	**77,200**	**72,300**	10,000 U	**14,800**	10,000 U	**16,200**
	Vanadium	50 U	**61**	**48**	**39**	**80**	**62**	**47**	**52**	**43**	5.0 U	5.0 U	5.0 U	5.0 U
	Zinc	20 U	20 U	20 U	20 U	**20.45 J**	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Metals, dissolved														
(ug/L)	Aluminum	**282.5 J**	50 U	**56**	**52**	50 U	50 U	50 U	**63**	50 U	**77**	**66**	**69**	**65**
	Arsenic	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
	Barium	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
	Calcium	5,000 U	**7,670**	**5,240**	**7,710**	**6,405**	**7,360**	**8,080**	**8,620**	**8,800**	**9,970**	**9,200**	**9,550**	**9,440**
	Chromium (total)	**49.5 J**	10 U	**21.6**	**33.4**	**11.2**	**10.1**	**10.7**	**15.6**	**15.4**	10 U	10 U	10 U	10 U
	Cobalt	**1.2 J**	**0.70**	**0.20**	**7.1**	**0.85**	**0.60**	**0.50**	**0.70**	**0.50**	**1.8**	**2.1**	**3.6**	**5.4**
	Copper	**6.5 J**	**3.0**	**3.0**	**5.0**	**4.0**	**3.0**	**3.0**	**4.0**	**4.0**	1.0 U	**1.0**	1.0 U	**1.0**
	Iron	**2,770 J**	**250**	**739**	**1,980**	**279.5**	**338**	**287**	**404**	**389**	**288**	**255**	**246**	**389**
	Magnesium	**6,060 J**	5,000 U	**6,890**	**6,390 J**	**5,005 J**	**5,080**	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U
	Manganese	**326**	**121**	**56.9**	**1,160**	**182.5**	**159**	**93.7**	**56.6**	**19.7**	**67.9**	**74.2**	**126**	**81**
	Nickel	**10.45**	10 U	10 U	**24.2**	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Potassium	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U
	Sodium	40,600 J	**91,100**	**35,500**	**49,600**	**96,600**	**91,800**	**82,800**	**78,300**	**75,000**	10,000 U	**15,200**	10,000 U	**17,000**
	Vanadium	50 U	**46**	**19**	**31**	**70.5**	**52**	**38**	**45**	**40**	5.0 U	5.0 U	5.0 U	5.0 U
Hardness														
(ug/L)	Hardness, total	**55,850**	**39,200**	**54,900**	**49,000**	**31,400**	**49,000**	**44,900**	**48,800**	**42,900**	**60,500**	**58,500**	**39,000**	**39,000**

Notes:

ug/L - micrograms per liter.

J - Estimated value.

NA - Sample not analyzed for the listed analyte.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

VOCs - Volatile Organic Compounds.

Table A-2
Summary of Analytical Results for Reference Area Surface Water Samples -- October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SW-30**	**SW-31**	**SW-32**	**SW-33**	**SW-34**	**SW-35**	**SW-36**	**SW-37**
	Sample ID:	SW-30	SW-31	SW-32	SW-33	SW-34	SW-35	SW-36	SW-37
	Sample Date:	10/5/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/11/2011	10/11/2011	10/11/2011
VOCs									
	cis-1,2-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methyl Tert Butyl Ether	**0.24 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.89**	**2.3**
Metals, total									
(ug/L)	Aluminum	**167**	**119**	**92**	**107**	**160**	**190**	**316**	**612**
	Barium	R	200 U	200 U	200 U	200 U	200 U	**248**	**238**
	Calcium	R	**10,300**	**10,400**	**11,100**	**10,300**	**9,850**	**7,710**	**7,900**
	Chromium (total)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Cobalt	**5.7**	**6.0**	**4.8**	**4.8**	**5.4**	**5.8**	**13.1**	**23.6**
	Copper	1.0 U	1.0 U	**1.0**	1.0 U	**1.0**	**1.0**	**1.0**	**1.0**
	Iron	R	**306**	**253**	**272**	**368**	**195**	**359**	**1,320**
	Lead	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	**4.3**
	Magnesium	R	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U
	Manganese	R	**162**	**136**	**145**	**143**	**131**	**232**	**447**
	Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	**0.38**
	Nickel	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Potassium	R	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U
	Sodium	R	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	**12,800**	**13,400**
	Vanadium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Zinc	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Metals, dissolved									
(ug/L)	Aluminum	**77**	**68**	**58**	**50**	50 U	**83**	**108**	**162**
	Arsenic	R	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
	Barium	R	200 U	200 U	200 U	200 U	200 U	**249**	**275**
	Calcium	R	**10,400**	**10,500**	**10,800**	**10,400**	**10,000**	**7,770**	**8,960**
	Chromium (total)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Cobalt	**4.7**	**5.4**	**4.4**	**4.4**	**4.4**	**5.5**	**11.3**	**22.3**
	Copper	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.0**
	Iron	R	**127**	**105**	**102**	**103**	**110**	**129**	100 U
	Magnesium	R	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U
	Manganese	R	**158**	**131**	**135**	**127**	**135**	**233**	**527**
	Nickel	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Potassium	R	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U
	Sodium	R	10,000 U	10,000 U	10,000 U	10,000 U	10,000 U	**12,900**	**15,500**
	Vanadium	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Hardness									
(ug/L)	Hardness, total	**46,800**	**39,200**	**43,100**	**43,100**	**47,000**	**51,000**	**39,200**	**47,000**

Notes:

ug/L - micrograms per liter.
J - Estimated value.
NA - Sample not analyzed for the listed analyte.
R - Rejected data point.
U - Compound was not detected at specified quantitation limit.
Values in **Bold** indicate the compound was detected.
VOCs - Volatile Organic Compounds.

Table A-3
Summary of Analytical Results for Hudson Branch Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

	Sample Location:	**SD-01**	**SD-04**		**SD-09**	**SD-10**	**SD-10-1**	**SD-10-2**	**SD-12**	**SD-13**	**SD-13-1**	**SD-13-2**	**SD-15**		**SD-15-1**
Analysis	Sample ID:	SD-01A	SD-04-0309-A	SD-04A	SD-9A-0309-A	SD-10A	SD-10-1A	SD-10-2A	SD-12-0309-A	SD-13A	SD-13-1A	SD-13-2A	SD-15-0309-A	SD-15A	SD-15-1A
	Sample Depth (ft.):	0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI
	Sample Date:	10/13/2011	3/18/2009	10/6/2011	3/19/2009	10/12/2011	10/12/2011	10/12/2011	3/19/2009	10/12/2011	10/12/2011	10/12/2011	3/19/2009	10/7/2011	10/10/2011
SVOCs															
(mg/kg)	Acenaphthene	NA	NA	0.057 U	NA	**0.0198 J**	0.074 UJ	0.13 UJ	NA	0.13 U	0.060 U	0.11 UJ	NA	0.069 U	0.29 UJ
	Acenaphthylene	NA	NA	0.057 U	NA	**0.03835 J**	**0.1685 J**	**0.0967 J**	NA	**0.112 J**	**0.121**	**0.357 J**	NA	0.069 U	0.29 UJ
	Anthracene	NA	NA	0.057 U	NA	**0.0628**	**0.1635 J**	**0.145 J**	NA	**0.104 J**	**0.073**	**0.262 J**	NA	0.069 U	0.29 UJ
	Benzo(a)anthracene	NA	NA	**0.0479 J**	NA	**0.238**	**0.271 J**	**0.604 J**	NA	**0.1315 J**	**0.141**	**0.362 J**	NA	0.069 U	**0.133 J**
	Benzo(a)pyrene	NA	NA	**0.0574**	NA	**0.239**	**0.3245 J**	**0.674 J**	NA	**0.1675 J**	**0.184**	**0.441 J**	NA	0.069 U	0.29 UJ
	Benzo(b)fluoranthene	NA	NA	**0.0724**	NA	**0.3485**	**0.408 J**	**0.963 J**	NA	**0.1855 J**	**0.175**	**0.601 J**	NA	0.069 U	0.29 UJ
	Benzo(g,h,i)perylene	NA	NA	**0.0499 J**	NA	**0.1785**	**0.2635 J**	**0.51 J**	NA	**0.178 J**	**0.16**	**0.416 J**	NA	0.069 U	0.29 UJ
	Benzo(k)fluoranthene	NA	NA	**0.0393 J**	NA	**0.1115**	**0.135 J**	**0.346 J**	NA	**0.10695 J**	**0.0933**	**0.197 J**	NA	0.069 U	0.29 UJ
	Carbazole	NA	NA	0.11 U	NA	**0.04495 J**	**0.0551 J**	**0.0815 J**	NA	0.26 U	0.12 U	0.22 UJ	NA	0.14 U	0.58 UJ
	Chrysene	NA	NA	**0.0669**	NA	**0.285**	**0.3795 J**	**0.826 J**	NA	**0.2015**	**0.221**	**0.489 J**	NA	0.069 U	**0.159 J**
	Dibenzo(a,h)anthracene	NA	NA	0.057 U	NA	**0.04705 J**	**0.0666 J**	**0.123 J**	NA	0.13 U	0.06 U	**0.104 J**	NA	0.069 U	0.29 UJ
	Di-n-octyl phthalate	NA	NA	0.11 U	NA	0.092 U	0.15 UJ	0.25 UJ	NA	0.26 U	0.12 U	0.22 UJ	NA	0.14 U	0.58 UJ
	Diethyl phthalate	NA	NA	0.11 U	NA	0.092 U	0.15 UJ	0.25 UJ	NA	0.26 U	0.12 U	0.22 UJ	NA	0.14 U	0.58 UJ
	Dimethyl phthalate	NA	NA	**0.222 B**	NA	**0.0643**	**0.1165 J**	0.25 UJ	NA	**0.41 J**	**0.175**	**0.118 J**	NA	**0.155**	0.58 UJ
	bis(2-ethylhexyl)phthalate	NA	NA	0.11 U	NA	**0.588**	**1.25 J**	**1.23 J**	NA	**0.31 J**	**0.101 J**	**0.234 J**	NA	0.14 U	**0.82 J**
	Fluoranthene	NA	NA	**0.105**	NA	**0.6105**	**0.651 J**	**1.48 J**	NA	**0.2465**	**0.289**	**0.677 J**	NA	**0.0357 J**	**0.287 J**
	Fluorene	NA	NA	0.057 U	NA	**0.0355 J**	0.074 UJ	**0.0585 J**	NA	0.13 U	0.060 U	**0.0487 J**	NA	0.069 U	0.29 UJ
	Indeno(1,2,3-cd)pyrene	NA	NA	**0.0408 J**	NA	**0.161**	**0.199 J**	**0.438 J**	NA	**0.1605 J**	**0.146**	**0.323 J**	NA	0.069 U	0.29 UJ
	2-Methylnaphthalene	NA	NA	0.11 U	NA	0.092 U	0.15 UJ	0.25 UJ	NA	0.26 U	0.12 U	**0.0812 J**	NA	0.14 U	0.58 UJ
	Phenanthrene	NA	NA	**0.0495 J**	NA	**0.307**	**0.353 J**	**0.698 J**	NA	**0.1685 J**	**0.233**	**0.459 J**	NA	0.069 U	**0.158 J**
	Pyrene	NA	NA	**0.115**	NA	**0.5225**	**0.727 J**	**1.27 J**	NA	**0.306**	**0.378**	**0.900 J**	NA	**0.0401 J**	**0.304 J**
Pesticides															
(mg/kg)	alpha-Chlordane	NA	NA	0.0012 U	NA	0.0009 U	**0.00455 J**	**0.0066 J**	NA	**0.0069 J**	0.0013 U	0.0023 UJ	NA	0.0014 U	0.0030 UJ
	gamma-Chlordane	NA	NA	0.0012 U	NA	0.0009 U	0.0015 UJ	0.0026 UJ	NA	**0.0058 J**	0.0013 U	0.0023 UJ	NA	0.0014 U	0.0030 UJ
	Dieldrin	NA	NA	0.0012 U	NA	0.0009 U	0.0015 UJ	0.0026 UJ	NA	**0.0051 J**	0.0013 U	0.0023 UJ	NA	**0.0028**	0.0030 UJ
	4,4'-DDD	NA	NA	**0.0118**	NA	**0.0017 J**	**0.0179 J**	**0.0086 J**	NA	**0.0095 J**	**0.0062**	**0.0296 J**	NA	0.0014 U	0.0030 UJ
	4,4'-DDE	NA	NA	**0.0075**	NA	**0.0017 J**	**0.01065 J**	**0.0090 J**	NA	**0.0068 J**	**0.0030**	**0.0106 J**	NA	**0.0029**	0.0030 UJ
	4,4'-DDT	NA	NA	**0.0065**	NA	**0.0017 J**	**0.00645 J**	**0.0074 J**	NA	**0.0093 J**	0.0013 U	**0.0107 J**	NA	0.0014 U	0.0030 UJ
	Endosulfan sulfate	NA	NA	0.0012 U	NA	0.0009 U	0.0015 UJ	0.0026 UJ	NA	0.0027 U	0.0013 U	0.0023 UJ	NA	0.0014 U	0.0030 UJ
	Endosulfan-II	NA	NA	0.0012 U	NA	0.0009 U	0.0015 UJ	0.0026 UJ	NA	0.0027 U	0.0013 U	0.0023 UJ	NA	0.0014 U	0.0030 UJ
	Methoxychlor	NA	NA	0.0024 U	NA	0.0019 U	0.003 UJ	0.0052 UJ	NA	0.0054 U	0.0025 U	0.0046 UJ	NA	0.0028 U	0.006 UJ
PCBs															
(mg/kg)	Aroclor 1248	NA	NA	0.059 U	NA	0.047 U	0.076 UJ	0.13 UJ	NA	0.13 U	0.063 U	0.11 UJ	NA	**0.200**	**0.313 J**
	Aroclor 1254	NA	NA	0.059 U	NA	0.047 U	**0.1485 J**	0.13 UJ	NA	0.13 U	0.063 U	0.11 UJ	NA	**0.110**	0.150 UJ
	Aroclor 1260	NA	NA	0.059 U	NA	0.047 U	0.076 UJ	0.13 UJ	NA	0.13 U	0.063 U	0.11 UJ	NA	**0.108**	**0.256 J**
	Total PCBs	NA	NA	0.059 U	NA	0.047 U	**0.1485 J**	0.13 UJ	NA	0.13 U	0.063 U	0.11 UJ	NA	**0.418**	**0.569 J**
Metals, total															
(mg/kg)	Aluminum	NA	NA	**3,770**	NA	**6,120**	**27,300 J**	**21,100 J**	NA	**31,800**	**24,600**	**37,800 J**	NA	**6,640**	**27,800 J**
	Antimony	2.2 U	NA	3.8 U	NA	**3.05 J**	**26.65 J**	**8.5 J**	NA	8.5 U	4.1 U	**34.3 J**	NA	**18.9**	**23.4 J**
	Arsenic	NA	**3.3 J**	**3.8**	**5.5 J**	**2.9**	**9.15 J**	**6.5 J**	**7 J**	**25.85**	**20.8**	**12.5 J**	**8.0 J**	**7.4**	**34.7 J**
	Barium	**62.3**	NA	**68.6**	NA	**35.05**	**350.5 J**	**124 J**	NA	**394**	**237**	**356 J**	NA	**164**	**302 J**
	Beryllium	**0.89**	NA	0.38 U	NA	**1.15**	**10.65 J**	**3.9 J**	NA	0.85 U	**1.2**	**6.3 J**	NA	0.49 U	**1.2 J**
	Cadmium	NA	0.51 UJ	0.94 U	**1.2 J**	0.48 U	**2.45 J**	**2.4 J**	0.50 UJ	2.1 U	1.0 U	**1.1 J**	0.51 UJ	1.2 U	**2.5 J**
	Calcium	NA	NA	**1,440**	NA	**663 J**	**710 J**	**3,110 J**	NA	**2,905**	**1,670**	**2,790 J**	NA	**1,630**	**2,980 J**
	Chromium	**150**	**657 J**	**630**	**5,440 J**	**473 J**	**4,490 J**	**1,270 J**	**2,835 J**	**6,295**	**4,130**	**6,530 J**	**698 J**	**2,890**	**10,200 J**
	Cobalt	NA	NA	9.4 U	NA	4.8 U	**19.6 J**	**8.7 J**	NA	21 U	**10.8**	**21.9 J**	NA	12 U	**33.3 J**
	Copper	**8.0**	**32.6 J**	**30.1**	**80.4 J**	**65.95**	**238.5 J**	**232 J**	**146 J**	**222.5**	**33.7**	**245 J**	**85.8 J**	**118**	**246 J**
	Iron	NA	**6,380 J**	**5,890**	**16,700 J**	**10,170 J**	**31,050 J**	**22,600 J**	**14,500 J**	**34,800**	**26,900**	**36,000 J**	**17,700 J**	**9,930**	**33,300 J**
	Lead	**22.1**	**34.6 J**	**33.4**	**124 J**	**48.35 J**	**317.5 J**	**185 J**	**109 J**	**303**	**66.9**	**307 J**	**85.5 J**	**70.5**	**283 J**
	Magnesium	NA	NA	940 U	NA	**544 J**	**1,385 J**	**1,910 J**	NA	2,100 U	**1,970**	**1,950 J**	NA	1,200 U	**2,360 J**
	Manganese	NA	238 J	**257**	**153 J**	**45.15 J**	**281.5 J**	**167 J**	**48 J**	**228.5**	**170**	**355 J**	**272 J**	**205**	**507 J**

Table A-3
Summary of Analytical Results for Hudson Branch Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SD-01**	**SD-04**		**SD-09**	**SD-10**	**SD-10-1**	**SD-10-2**	**SD-12**	**SD-13**	**SD-13-1**	**SD-13-2**	**SD-15**		**SD-15-1**
	Sample ID:	SD-01A	SD-04-0309-A	SD-04A	SD-9A-0309-A	SD-10A	SD-10-1A	SD-10-2A	SD-12-0309-A	SD-13A	SD-13-1A	SD-13-2A	SD-15-0309-A	SD-15A	SD-15-1A
	Sample Depth (ft.):	0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI
	Sample Date:	10/13/2011	3/18/2009	10/6/2011	3/19/2009	10/12/2011	10/12/2011	10/12/2011	3/19/2009	10/12/2011	10/12/2011	10/12/2011	3/19/2009	10/7/2011	10/10/2011
	Mercury	**0.075**	**0.21 J**	**0.31**	**0.31 J**	**0.13 J**	**1.4 J**	**0.48 J**	**1 J**	**2.05**	**0.21**	**1.8 J**	**0.48 J**	**0.37**	**0.67 J**
	Nickel	**10.6**	**49.7 J**	**73.1**	**114 J**	**50.6**	**329 J**	**160 J**	**56 J**	**193**	**64.9**	**215 J**	**218 J**	**239**	**1,140 J**
	Potassium	NA	NA	1,900 U	NA	950 U	1,000 UJ	1,000 UJ	NA	4,200 U	2,100 U	**1,200 J**	NA	2,400 U	**1,130 J**
	Selenium	2.2 U	NA	3.8 U	NA	1.9 U	2.0 UJ	2.0 UJ	NA	8.5 U	4.1 U	2.0 UJ	NA	4.9 U	**2.0 J**
	Silver	NA	NA	0.94 U	NA	0.48 U	**0.615 J**	0.50 UJ	NA	2.1 U	1.0 U	0.50 UJ	NA	1.2 U	2.4 UJ
	Vanadium	**84.3**	NA	**176**	NA	**203 J**	**1,870 J**	**651 J**	NA	**945**	**391**	**946 J**	NA	**554**	**3,280 J**
	Zinc	**30.1**	**57.7 J**	**61.7**	**231 J**	**99.35 J**	**400 J**	**439 J**	**79 J**	**321**	**153**	**375 J**	**128 J**	**117**	**525 J**
General Chemistry															
(mg/kg)	Total Organic Carbon	NA	**43,400 J**	**39,200**	**158,000 J**	**22,850**	**61,350**	**116,000**	**79,950 J**	**127,500**	**43,800**	**123,000**	**60,900 J**	**44,900**	**123,000**
(s.u.)	pH	NA	**7.16 J**	**6.72**	**5.37 J**	**6.105**	**5.52**	**5.83**	**5 J**	**6.74**	**7.32**	**6.39**	**6.83 J**	**7.39**	**6.53**

Notes:

mg/kg - milligrams per kilogram (dry weight) or ppm.

s.u. - Standard unit.

B - Compound detected in associated method blank

J - Estimated value.

NA - Sample not analyzed for the listed analyte.

U - Compound was not detected at quantitation limit.

UJ - Estimated non-detect.

Values in **Bold** indicate the compound was detected.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

BWSI - Below water-sediment interface.

Table A-3
Summary of Analytical Results for Hudson Branch Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SD-17**		**SD-18**		**SD-19**		**SD-20**	**SD-21**	**SD-23**		**SD-100A**	**SD-24**	**SD-25**		**SD-26**
	Sample ID:	SD-17-0309-A	BERA-SD-04	SD-18-0309-A	SD-18A	SD-19-0309-A	BERA-SD-05	SD-20-0309-A	BERA-SD-06	SD-23-0309-A	SD-23A	BERA-SD-07	BERA-SD-08	SD-25-0309-A	SD25A	SD26A
	Sample Depth (ft.):	0.5 BWSI	0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0.5 BWSI	0.5 BWSI	0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI
	Sample Date:	3/18/2009	10/7/2011	3/18/2009	10/7/2011	3/18/2009	10/7/2011	3/18/2009	10/6/2011	3/18/2009	10/6/2011	10/6/2011	10/6/2011	3/18/2009	10/5/2011	10/5/2011
SVOCs																
(mg/kg)	Acenaphthene	NA	NA	NA	0.066 U	NA	NA	NA	NA	NA	0.042 U	NA	NA	NA	NA	NA
	Acenaphthylene	NA	NA	NA	**0.0532 J**	NA	NA	NA	NA	NA	0.042 U	NA	NA	NA	NA	NA
	Anthracene	NA	NA	NA	**0.0373 J**	NA	NA	NA	NA	NA	0.042 U	NA	NA	NA	NA	NA
	Benzo(a)anthracene	NA	NA	NA	**0.127**	NA	NA	NA	NA	NA	**0.0584**	NA	NA	NA	NA	NA
	Benzo(a)pyrene	NA	NA	NA	**0.155**	NA	NA	NA	NA	NA	**0.077**	NA	NA	NA	NA	NA
	Benzo(b)fluoranthene	NA	NA	NA	**0.169**	NA	NA	NA	NA	NA	**0.14**	NA	NA	NA	NA	NA
	Benzo(g,h,i)perylene	NA	NA	NA	**0.117**	NA	NA	NA	NA	NA	**0.0475**	NA	NA	NA	NA	NA
	Benzo(k)fluoranthene	NA	NA	NA	**0.149**	NA	NA	NA	NA	NA	**0.0367 J**	NA	NA	NA	NA	NA
	Carbazole	NA	NA	NA	0.13 U	NA	NA	NA	NA	NA	0.085 U	NA	NA	NA	NA	NA
	Chrysene	NA	NA	NA	**0.204**	NA	NA	NA	NA	NA	**0.102**	NA	NA	NA	NA	NA
	Dibenzo(a,h)anthracene	NA	NA	NA	**0.0376 J**	NA	NA	NA	NA	NA	**0.0176 J**	NA	NA	NA	NA	NA
	Di-n-octyl phthalate	NA	NA	NA	0.13 U	NA	NA	NA	NA	NA	0.085 U	NA	NA	NA	NA	NA
	Diethyl phthalate	NA	NA	NA	0.13 U	NA	NA	NA	NA	NA	0.085 U	NA	NA	NA	NA	NA
	Dimethyl phthalate	NA	NA	NA	**0.241**	NA	NA	NA	NA	NA	0.085 U	NA	NA	NA	NA	NA
	bis(2-ethylhexyl)phthalate	NA	NA	NA	**0.119 J**	NA	NA	NA	NA	NA	0.085 U	NA	NA	NA	NA	NA
	Fluoranthene	NA	NA	NA	**0.325**	NA	NA	NA	NA	NA	**0.0679**	NA	NA	NA	NA	NA
	Fluorene	NA	NA	NA	0.066 U	NA	NA	NA	NA	NA	0.042 U	NA	NA	NA	NA	NA
	Indeno(1,2,3-cd)pyrene	NA	NA	NA	**0.0918**	NA	NA	NA	NA	NA	**0.0444**	NA	NA	NA	NA	NA
	2-Methylnaphthalene	NA	NA	NA	0.13 U	NA	NA	NA	NA	NA	0.085 U	NA	NA	NA	NA	NA
	Phenanthrene	NA	NA	NA	**0.171**	NA	NA	NA	NA	NA	0.042 U	NA	NA	NA	NA	NA
	Pyrene	NA	NA	NA	**0.35**	NA	NA	NA	NA	NA	**0.0853**	NA	NA	NA	NA	NA
Pesticides																
(mg/kg)	alpha-Chlordane	NA	NA	NA	0.0014 U	NA	NA	NA	NA	NA	0.00087 U	NA	NA	NA	NA	NA
	gamma-Chlordane	NA	NA	NA	0.0014 U	NA	NA	NA	NA	NA	0.00087 U	NA	NA	NA	NA	NA
	Dieldrin	NA	NA	NA	0.0014 U	NA	NA	NA	NA	NA	0.00087 U	NA	NA	NA	NA	NA
	4,4'-DDD	NA	NA	NA	0.0014 U	NA	NA	NA	NA	NA	**0.0048**	NA	NA	NA	NA	NA
	4,4'-DDE	NA	NA	NA	0.0014 U	NA	NA	NA	NA	NA	**0.0047**	NA	NA	NA	NA	NA
	4,4'-DDT	NA	NA	NA	0.0014 U	NA	NA	NA	NA	NA	**0.0056**	NA	NA	NA	NA	NA
	Endosulfan sulfate	NA	NA	NA	0.0014 U	NA	NA	NA	NA	NA	0.00087 U	NA	NA	NA	NA	NA
	Endosulfan-II	NA	NA	NA	0.0014 U	NA	NA	NA	NA	NA	0.00087 U	NA	NA	NA	NA	NA
	Methoxychlor	NA	NA	NA	0.0028 U	NA	NA	NA	NA	NA	0.0017 U	NA	NA	NA	NA	NA
PCBs																
(mg/kg)	Aroclor 1248	NA	NA	NA	**0.163**	NA	NA	NA	NA	NA	0.044 U	NA	NA	NA	NA	NA
	Aroclor 1254	NA	NA	NA	**0.129**	NA	NA	NA	NA	NA	0.044 U	NA	NA	NA	NA	NA
	Aroclor 1260	NA	NA	NA	0.069 U	NA	NA	NA	NA	NA	0.044 U	NA	NA	NA	NA	NA
	Total PCBs	NA	NA	NA	**0.292**	NA	NA	NA	NA	NA	0.044 U	NA	NA	NA	NA	NA
Metals, total																
(mg/kg)	Aluminum	NA	NA	NA	**10,200**	NA	NA	NA	NA	NA	**1,700**	NA	NA	NA	**4,750**	**2,300**
	Antimony	NA	**19.4**	NA	**16.7**	NA	**27.7**	NA	7.0 U	NA	3.1 U	4.1 U	4.5 U	NA	6.3 U	4.7 U
	Arsenic	**15.6 J**	NA	**27.5 J**	**8.2**	**2.4 J**	NA	**2.2 J**	NA	**4.4 J**	3.1 U	NA	NA	**3.0 J**	6.3 U	4.7 U
	Barium	NA	**204**	NA	**102**	NA	**163**	NA	**298**	NA	**49.3**	**101**	**92.5**	NA	**142**	**114**
	Beryllium	NA	0.78 U	NA	0.47 U	NA	**0.75 J**	NA	0.70 U	NA	0.31 U	0.41 U	0.45 U	NA	0.63 U	0.47 U
	Cadmium	**0.59 J**	NA	2.6 UJ	1.2 U	0.51 UJ	NA	0.54 UJ	NA	0.54 UJ	0.76 U	NA	NA	0.51 UJ	1.6 U	1.2 U
	Calcium	NA	NA	NA	**1,410**	NA	NA	NA	NA	NA	760 U	NA	NA	NA	**1,880**	**1,450**
	Chromium	**3,150 J**	**2,820**	**6,160 J**	**2,580**	**388 J**	**3,820**	**344 J**	**3,470**	**418 J**	**500**	**424**	**700**	**594 J**	**1,240**	**744**
	Cobalt	NA	NA	NA	12 U	NA	NA	NA	NA	NA	7.6 U	NA	NA	NA	16 U	12 U
	Copper	**147 J**	**247**	**230 J**	**81.1**	**22.9 J**	**139.8**	**23.3 J**	**141**	**22.3 J**	**13.8**	**19.9**	**20.1**	**13.2 J**	**18.0**	**7.1**
	Iron	**16,700 J**	NA	**24,200 J**	**10,300**	**3,660 J**	NA	**4,610 J**	NA	**6,290 J**	**2,470**	NA	NA	**3,830 J**	**5,360**	**2,330**
	Lead	**156 J**	**205**	**177 J**	**107**	**25.8 J**	**145.65**	**19.9 J**	**89.7**	**35.5 J**	**13.2**	**23.4**	**24.5**	**29.1 J**	**28.2**	**14.2**
	Magnesium	NA	NA	NA	1,200 U	NA	NA	NA	NA	NA	760 U	NA	NA	NA	1,600 U	1,200 U
	Manganese	**291 J**	NA	**460 J**	**180**	**173 J**	NA	**179 J**	NA	**85.7 J**	**128**	NA	NA	**224 J**	**206**	**172**

Table A-3
Summary of Analytical Results for Hudson Branch Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SD-17**		**SD-18**		**SD-19**		**SD-20**	**SD-21**	**SD-23**		**SD-100A**	**SD-24**	**SD-25**		**SD-26**
	Sample ID:	SD-17-0309-A	BERA-SD-04	SD-18-0309-A	SD-18A	SD-19-0309-A	BERA-SD-05	SD-20-0309-A	BERA-SD-06	SD-23-0309-A	SD-23A	BERA-SD-07	BERA-SD-08	SD-25-0309-A	SD25A	SD26A
	Sample Depth (ft.):	0.5 BWSI	0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0.5 BWSI	0.5 BWSI	0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI
	Sample Date:	3/18/2009	10/7/2011	3/18/2009	10/7/2011	3/18/2009	10/7/2011	3/18/2009	10/6/2011	3/18/2009	10/6/2011	10/6/2011	10/6/2011	3/18/2009	10/5/2011	10/5/2011
	Mercury	**0.63 J**	**0.79**	**2.5 J**	**1.8**	**0.14 J**	**1.785**	**0.32 J**	**0.79**	**0.13 J**	**1.0**	**0.098**	**0.11**	**0.15 J**	**0.22**	**0.19**
	Nickel	**356 J**	**643**	**332 J**	**158**	**52.7 J**	**163**	**39.4 J**	**331**	**18.1 J**	**16.4**	**31.8**	**27.8**	**22.4 J**	**45.9**	**28.8**
	Potassium	NA	NA	NA	2,300 U	NA	NA	NA	NA	NA	1,500 U	NA	NA	NA	3,200 U	2,400 U
	Selenium	NA	7.8 U	NA	4.7 U	NA	5.4 U	NA	7.0 U	NA	3.1 U	4.1 U	4.5 U	NA	6.3 U	4.7 U
	Silver	NA	NA	NA	1.2 U	NA	NA	NA	NA	NA	0.76 U	NA	NA	NA	1.6 U	1.2 U
	Vanadium	NA	**978**	NA	**595**	NA	**543.5**	NA	**1,450**	NA	**93.1**	**167**	**107**	NA	**354**	**207**
	Zinc	**192 J**	**380**	**258 J**	**96.0**	**39.1 J**	**140**	**41.9 J**	**240**	**63.8 J**	**27.4**	**55.8**	**66.3**	**56.5 J**	**79.3**	**48.9**
General Chemistry																
(mg/kg)	Total Organic Carbon	**60,900 J**	NA	**119,000 J**	**34,500**	**65,000 J**	NA	**86,700 J**	NA	**66,000 J**	**13,800**	NA	NA	**70,900 J**	**33,800**	**37,600**
(s.u.)	pH	**7.04 J**	NA	**6.78 J**	**6.96**	**6.93 J**	NA	**6.60 J**	NA	**6.57 J**	**7.19**	NA	NA	**6.67 J**	**7.00**	**6.69**

Notes:

mg/kg - milligrams per kilogram (dry weight) or ppm.
s.u. - Standard unit.
B - Compound detected in associated method blank
J - Estimated value.
NA - Sample not analyzed for the listed analyte.
U - Compound was not detected at quantitation limit.
UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
BWSI - Below water-sediment interface.

R2-0001611

Table A-3
Summary of Analytical Results for Hudson Branch Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SD-27**	**SD-28**	**SD-29**	**SD-38**	**SD-IMP1A**	**SD-IMP2A**	**SD-IMP3A**	**SD-IMP4A**	**SD-IMP5A**	**SD-IMP6A**
	Sample ID:	SD27A	SD28A	SD29A	SD38A	SD-IMP1A	SD-IMP2A	SD-IMP3A	SD-IMP4A	SD-IMP5A	SD-IMP6A
	Sample Depth (ft.):	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI
	Sample Date:	10/5/2011	10/4/2011	10/5/2011	10/4/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011
SVOCs											
(mg/kg)	Acenaphthene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Acenaphthylene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Anthracene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Benzo(a)anthracene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	**0.0177 J**	0.034 U	0.036 U
	Benzo(a)pyrene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Benzo(b)fluoranthene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Benzo(g,h,i)perylene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Benzo(k)fluoranthene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Carbazole	NA	NA	NA	NA	0.073 U	0.067 U	0.073 U	0.088 U	0.068 U	0.072 U
	Chrysene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	**0.0192 J**	0.034 U	0.036 U
	Dibenzo(a,h)anthracene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Di-n-octyl phthalate	NA	NA	NA	NA	**0.197**	0.067 U	0.073 U	0.088 U	0.068 U	0.072 U
	Diethyl phthalate	NA	NA	NA	NA	0.073 U	0.067 U	0.073 U	0.088 U	0.068 U	0.072 U
	Dimethyl phthalate	NA	NA	NA	NA	**0.0729 J**	**0.0443 J**	**0.038 J**	0.088 U	**0.0493 J**	**0.0582 J**
	bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	**0.0835**	**0.0351 J**	**0.0617 J**	0.088 U	**0.0441 J**	**0.0675 J**
	Fluoranthene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	**0.0304 J**	0.034 U	0.036 U
	Fluorene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	2-Methylnaphthalene	NA	NA	NA	NA	0.073 U	0.067 U	0.073 U	0.088 U	0.068 U	0.072 U
	Phenanthrene	NA	NA	NA	NA	0.036 U	0.033 U	0.036 U	0.044 U	0.034 U	0.036 U
	Pyrene	NA	NA	NA	NA	0.036 U	**0.015 J**	0.036 U	**0.0283 J**	0.034 U	0.036 U
Pesticides											
(mg/kg)	alpha-Chlordane	NA	NA	NA	NA	0.00075 U	0.00069 U	0.00075 U	0.00091 U	0.00070 U	0.00073 U
	gamma-Chlordane	NA	NA	NA	NA	0.00075 U	0.00069 U	0.00075 U	0.00091 U	0.00070 U	0.00073 U
	Dieldrin	NA	NA	NA	NA	**0.0016**	**0.0017**	0.00075 U	0.00091 U	0.00070 U	0.00073 U
	4,4'-DDD	NA	NA	NA	NA	0.00075 U	**0.0021**	0.00075 U	**0.0033**	0.00070 U	0.00073 U
	4,4'-DDE	NA	NA	NA	NA	**0.0017**	**0.0024**	0.00075 U	0.00091 U	0.00070 U	0.00073 U
	4,4'-DDT	NA	NA	NA	NA	0.00075 U	0.00069 U	0.00075 U	0.00091 U	0.00070 U	0.00073 U
	Endosulfan sulfate	NA	NA	NA	NA	0.00075 U	0.00069 U	0.00075 U	0.00091 U	0.00070 U	0.00073 U
	Endosulfan-II	NA	NA	NA	NA	0.00075 U	0.00069 U	0.00075 U	0.00091 U	0.00070 U	0.00073 U
	Methoxychlor	NA	NA	NA	NA	0.0015 U	0.0014 U	0.0015 U	0.0018 U	0.0014 U	0.0015 U
PCBs											
(mg/kg)	Aroclor 1248	NA	NA	NA	NA	0.037 U	0.034 U	0.038 U	0.045 U	0.035 U	0.037 U
	Aroclor 1254	NA	NA	NA	NA	0.037 U	0.034 U	0.038 U	0.045 U	0.035 U	0.037 U
	Aroclor 1260	NA	NA	NA	NA	**0.0603**	**0.0393**	0.038 U	0.045 U	0.035 U	0.037 U
	Total PCBs	NA	NA	NA	NA	**0.0603**	**0.0393**	0.038 U	0.045 U	0.035 U	0.037 U
Metals, total											
(mg/kg)	Aluminum	**3,510**	**562**	**2,780**	**296**	**3,870**	**6,610**	**21,200**	**5,050**	**8,550**	**6,990**
	Antimony	5.3 U	2.4 U	7.7 U	2.3 U	2.0 U	2.3 U	2.0 U	3.0 U	2.3 U	1.6 U
	Arsenic	5.3 U	2.4 U	7.7 U	2.3 U	2.0 U	**2.7**	**15.1**	3.0 U	**6.2**	**1.8**
	Barium	**118**	24 U	**172**	23 U	**24.9**	**30.2**	**35.8**	**35.3**	23 U	**18.5**
	Beryllium	**0.68**	0.24 U	**0.91**	0.23 U	0.20 U	0.23 U	**0.43**	0.30 U	**0.25**	0.16 U
	Cadmium	1.3 U	0.59 U	1.9 U	0.58 U	0.50 U	0.58 U	0.50 U	0.75 U	0.58 U	0.41 U
	Calcium	**1,520**	590 U	**2,550**	580 U	500 U	580 U	500 U	750 U	580 U	410 U
	Chromium	**565**	**20.4**	3.8 U	**13.4**	**86.3**	**75.2**	**28.7**	**88.4**	**25.5**	**33.7**
	Cobalt	13 U	5.9 U	19 U	5.8 U	5.0 U	5.8 U	**13.3**	7.5 U	5.8 U	4.1 U
	Copper	**7.2**	2.9 U	9.6 U	2.9 U	**9.6**	**11.5**	**7.5**	**7.3**	**4.8**	**3.2**
	Iron	**2,790**	**2,060**	**2,650**	**1,300**	**4,170**	**7,250**	**34,200**	**6,000**	**18,100**	**8,290**
	Lead	**20.9**	**4.8**	**10.9**	2.3 U	**16.8**	**28.9**	**19.3**	**51.5**	**8.5**	**12.1**
	Magnesium	1,300 U	590 U	1,900 U	580 U	500 U	580 U	**549**	750 U	580 U	410 U
	Manganese	**96.0**	**9.9**	**480**	**24.3**	**264**	**184**	**185**	**169**	**90.9**	**58.3**

Table A-3
Summary of Analytical Results for Hudson Branch Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	SD-27	SD-28	SD-29	SD-38	SD-IMP1A	SD-IMP2A	SD-IMP3A	SD-IMP4A	SD-IMP5A	SD-IMP6A
	Sample ID:	SD27A	SD28A	SD29A	SD38A	SD-IMP1A	SD-IMP2A	SD-IMP3A	SD-IMP4A	SD-IMP5A	SD-IMP6A
	Sample Depth (ft.):	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI
	Sample Date:	10/5/2011	10/4/2011	10/5/2011	10/4/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011
	Mercury	**0.31**	0.039 U	**0.63**	**2.3**	0.038 U	**0.11**	**0.10**	**0.094**	**0.049**	**0.085**
	Nickel	**16.3**	4.7 U	15 U	4.7 U	**19.9**	**27.2**	**9.5**	**13.0**	**9.4**	**6.3**
	Potassium	2,700 U	1,200 U	3,800 U	1,200 U	1,000 U	1,200 U	1,000 U	1,500 U	1,200 U	820 U
	Selenium	5.3 U	2.4 U	7.7 U	2.3 U	2.0 U	2.3 U	2.0 U	3.0 U	2.3 U	1.6 U
	Silver	1.3 U	0.59 U	1.9 U	0.58 U	0.50 U	0.58 U	0.50 U	0.75 U	0.58 U	0.41 U
	Vanadium	**84.9**	**5.9**	19 U	**9.5**	**77.6**	**156**	**38.2**	**55.0**	**38.4**	**28.5**
	Zinc	**46.0**	**6.0**	**25.1**	**2.7**	**55.5**	**50.7**	**20.2**	**64.2**	**19.9**	**16.6**
General Chemistry											
(mg/kg)	Total Organic Carbon	**46,500**	1,200 U	**67,500**	**1,220**	**2,820**	**4,520**	**1,890**	**16,400**	**1,540**	**5,400**
(s.u.)	pH	**6.53**	**6.85**	**6.17**	**6.15**	**7.48**	**6.91**	**7.00**	**6.89**	**6.91**	**7.05**

Notes:

mg/kg - milligrams per kilogram (dry weight) or ppm.
s.u. - Standard unit.
B - Compound detected in associated method blank
J - Estimated value.
NA - Sample not analyzed for the listed analyte.
U - Compound was not detected at quantitation limit.
UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
BWSI - Below water-sediment interface.

Table A-4
Summary of Analytical Results for Reference Area Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

	Sample Location:	**SD-30**		**SD-31**	**SD-32**	**SD-33**	**SD-34**	**SD-35**		**SD-36**	**SD-37**
	Sample ID:	SD-30-0309-A	SD30A	SD-31A	SD-32A	SD-33A	SD-34A	SD-35-0309-A	SD-35A	SD-36A	SD-37A
	Sample Depth (ft.):	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI
	Sample Date:	3/18/2009	10/5/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	3/19/2009	10/11/2011	10/11/2011	10/11/2011
SVOCs											
(mg/kg)	Acenaphthene	NA	0.24 U	0.15 UJ	0.061 UJ	0.06 UJ	0.26 U	NA	0.14 U	0.11 U	0.038 U
	Acenaphthylene	NA	0.24 U	0.15 UJ	0.061 UJ	0.06 UJ	0.26 U	NA	0.14 U	0.11 U	0.038 U
	Anthracene	NA	0.24 U	0.15 UJ	0.061 UJ	**0.0434 J**	0.26 U	NA	**0.0803 J**	0.11 U	0.038 U
	Benzo(a)anthracene	NA	**0.193 J**	0.15 UJ	0.061 UJ	**0.129 J**	0.26 U	NA	**0.176**	**0.109 J**	0.038 U
	Benzo(a)pyrene	NA	**0.171 J**	0.15 UJ	0.061 UJ	**0.12 J**	0.26 U	NA	**0.181**	**0.0972 J**	0.038 U
	Benzo(b)fluoranthene	NA	**0.214 J**	0.15 UJ	0.061 UJ	**0.119 J**	0.26 U	NA	**0.153**	**0.0897 J**	0.038 U
	Benzo(g,h,i)perylene	NA	**0.16 J**	0.15 UJ	0.061 UJ	**0.0901 J**	0.26 U	NA	**0.139 J**	**0.0835 J**	0.038 U
	Benzo(k)fluoranthene	NA	**0.152 J**	0.15 UJ	0.061 UJ	**0.103 J**	0.26 U	NA	**0.104 J**	**0.0596 J**	0.038 U
	Carbazole	NA	0.48 U	0.3 UJ	0.12 UJ	**0.0305 J**	0.52 U	NA	0.27 U	0.22 U	0.076 U
	Chrysene	NA	**0.255**	0.15 UJ	0.061 UJ	**0.154 J**	0.26 U	NA	**0.179**	**0.139**	0.038 U
	Dibenzo(a,h)anthracene	NA	0.24 U	0.15 UJ	0.061 UJ	0.06 UJ	0.26 U	NA	0.14 U	0.11 U	0.038 U
	Di-n-octyl phthalate	NA	0.48 U	0.3 UJ	0.12 UJ	0.12 UJ	0.52 U	NA	0.27 U	0.22 U	0.076 U
	Diethyl phthalate	NA	**0.319 J**	0.3 UJ	0.12 UJ	0.12 UJ	0.52 U	NA	0.27 U	0.22 U	0.076 U
	Dimethyl phthalate	NA	**0.799**	0.3 UJ	**0.0931 J**	**0.0721 J**	**1.14**	NA	0.27 U	0.22 U	0.076 U
	bis(2-Ethylhexyl)phthalate	NA	**0.727**	**0.452 J**	**0.109 J**	**0.204 J**	0.52 U	NA	0.27 U	**0.159 J**	0.076 U
	Fluoranthene	NA	**0.308**	0.15 UJ	0.061 UJ	**0.310 J**	**0.159 J**	NA	**0.254**	**0.154**	0.038 U
	Fluorene	NA	0.24 U	0.15 UJ	0.061 UJ	0.06 UJ	0.26 U	NA	0.14 U	0.11 U	0.038 U
	Indeno(1,2,3-cd)pyrene	NA	**0.158 J**	0.15 UJ	0.061 UJ	**0.0777 J**	0.26 U	NA	**0.131 J**	**0.0699 J**	0.038 U
	2-Methylnaphthalene	NA	0.48 U	0.3 UJ	0.12 UJ	0.12 UJ	0.52 U	NA	0.27 U	0.22 U	0.076 U
	Phenanthrene	NA	**0.156 J**	0.15 UJ	0.061 UJ	**0.196 J**	0.26 U	NA	**0.18**	**0.157**	0.038 U
	Pyrene	NA	**0.289**	0.15 UJ	0.061 UJ	**0.268 J**	**0.123 J**	NA	**0.254**	**0.204**	0.038 U
Pesticides											
(mg/kg)	alpha-Chlordane	NA	0.0049 U	0.0031 UJ	0.0012 UJ	**0.0036 J**	0.0054 U	NA	**0.0837**	0.0023 U	0.00079 U
	gamma-Chlordane	NA	0.0049 U	0.0031 UJ	0.0012 UJ	0.0013 UJ	0.0054 U	NA	**0.0812**	0.0023 U	0.00079 U
	Dieldrin	NA	0.0049 U	0.0031 UJ	0.0012 UJ	**0.0073 J**	0.0054 U	NA	0.0028 U	0.0023 U	0.00079 U
	4,4'-DDD	NA	0.0049 U	0.0031 UJ	**0.0029 J**	**0.0054 J**	0.0054 U	NA	**0.0128**	**0.136**	0.00079 U
	4,4'-DDE	NA	0.0049 U	0.0031 UJ	0.0012 UJ	**0.0054 J**	0.0054 U	NA	**0.0094**	**0.0143**	**0.0023**
	4,4'-DDT	NA	0.0049 U	**0.0069 J**	**0.0049 J**	**0.0092 J**	0.0054 U	NA	**0.0158**	**0.0415**	**0.0025**
	Endosulfan sulfate	NA	0.0049 U	0.0031 UJ	0.0012 UJ	**0.0039 J**	0.0054 U	NA	0.0028 U	0.0023 U	0.00079 U
	Endosulfan-II	NA	0.0049 U	0.0031 UJ	0.0012 UJ	**0.0034 J**	0.0054 U	NA	0.0028 U	0.0023 U	0.00079 U
	Methoxychlor	NA	0.0098 U	**0.0082 J**	0.0025 UJ	0.0025 UJ	0.011 U	NA	0.0056 U	0.0047 U	0.0016 U
PCBs											
(mg/kg)	Aroclor 1248	NA	0.25 U	0.16 UJ	0.062 UJ	0.061 UJ	0.27 U	NA	0.14 U	0.12 U	0.040 U
	Aroclor 1254	NA	0.25 U	0.16 UJ	0.062 UJ	0.061 UJ	0.27 U	NA	0.14 U	0.12 U	0.040 U
	Aroclor 1260	NA	0.25 U	0.16 UJ	0.062 UJ	0.061 UJ	0.27 U	NA	0.14 U	0.12 U	0.040 U
	Total PCBs	NA	0.25 U	0.16 UJ	0.062 UJ	0.061 UJ	0.27 U	NA	0.14 U	0.12 U	0.040 U
Metals, total											
(mg/kg)	Aluminum	NA	**16,300**	**2,160 J**	**1,130 J**	**2,880 J**	**21,800**	NA	**8,630**	**11,000**	**2,260**
	Antimony	NA	16 U	2.0 UJ	2.0 UJ	9.9 UJ	18 U	NA	9.9 U	7.8 U	2.8 U
	Arsenic	10 UJ	16 U	**2.3 J**	2.0 UJ	9.9 UJ	18 U	10 UJ	9.9 U	7.8 U	2.8 U
	Barium	NA	**430**	**107 J**	**29.2 J**	99 UJ	**381**	NA	**112**	**99.2**	28 U
	Beryllium	NA	**5.3**	**0.59 J**	**0.61 J**	**1.3 J**	**6.4**	NA	**2.7**	**2.7**	0.28 U
	Cadmium	2.6 UJ	4.0 U	0.50 UJ	0.50 UJ	2.5 UJ	4.6 U	2.6 UJ	2.5 U	1.9 U	0.69 U
	Calcium	NA	**5,190**	**1,440 J**	**859 J**	2,500 UJ	**5,120**	NA	2,500 U	1,900 U	690 U

R2-0001614

Table A-4
Summary of Analytical Results for Reference Area Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

	Sample Location:	**SD-30**		**SD-31**	**SD-32**	**SD-33**	**SD-34**	**SD-35**		**SD-36**	**SD-37**
	Sample ID:	SD-30-0309-A	SD30A	SD-31A	SD-32A	SD-33A	SD-34A	SD-35-0309-A	SD-35A	SD-36A	SD-37A
	Sample Depth (ft.):	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI	0-0.5 BWSI
	Sample Date:	3/18/2009	10/5/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	3/19/2009	10/11/2011	10/11/2011	10/11/2011
	Chromium	**7.8 J**	**17.8**	**3.4 J**	**3.4 J**	5.0 UJ	**22.3**	**38.3 J**	**15.0**	**11.0**	**2.7**
	Cobalt	NA	**162**	**7.4 J**	**8.5 J**	25 UJ	**166**	NA	25 U	19 U	6.9 U
	Copper	13 UJ	20 U	**3.6 J**	2.5 UJ	12 UJ	**27.6**	**28.3 J**	**14.2**	**13.9**	3.5 U
	Iron	**5,620 J**	**25,200**	**3,530 J**	**1,020 J**	**4,290 J**	**21,400**	**15,000 J**	**14,400**	**6,600**	**1,530**
	Lead	**56.3 J**	**68.9**	**11.6 J**	**4.8 J**	**19.3 J**	**83.7**	**91.9 J**	**38.9**	**64.0**	**6.8**
	Magnesium	NA	4,000 U	500 UJ	500 UJ	2,500 UJ	4,600 U	NA	2,500 U	1,900 U	690 U
	Manganese	**406 J**	**1,150**	**119 J**	**63.3 J**	**165 J**	**1,260**	**66.9 J**	**45.8**	**36.6**	**5.7**
	Mercury	**0.70 J**	**12.7**	**0.27 J**	**0.13 J**	**1.4 J**	**1.3**	**1.5 J**	**0.67**	**0.24**	**0.94**
	Nickel	21 UJ	**41.1**	**5.6 J**	**4.1 J**	**6.5 J**	**60.8**	**22.3 J**	20 U	**16.5**	5.6 U
	Potassium	NA	8,100 U	990 UJ	1,000 UJ	5,000 UJ	9,200 U	NA	4,900 U	3,900 U	1,400 U
	Selenium	NA	16 U	2.0 UJ	2.0 UJ	9.9 UJ	18 U	NA	9.9 U	7.8 U	2.8 U
	Silver	NA	4.0 U	0.50 UJ	0.50 UJ	2.5 UJ	4.6 U	NA	2.5 U	1.9 U	0.69 U
	Vanadium	NA	40 U	**5.4 J**	5.0 UJ	25 UJ	46 U	NA	25 U	19 U	6.9 U
	Zinc	**78.6 J**	**147**	**11.0 J**	**3.0 J**	**21.5 J**	**197**	**87.6 J**	**24.5**	**22.4**	**4.1**
General Chemistry											
(mg/kg)	Total Organic Carbon	**213,000 J**	**197,000**	**203,000**	**40,000**	**52,600**	**217,000**	**248,000 J**	**196,000**	**162,000**	**10,600**
(s.u.)	pH	**5.78 J**	**6.13**	**5.59**	**5.72**	**5.94**	**6.10**	**5.70 J**	**5.67**	**4.98**	**5.09**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

s.u. - Standard unit.

B - Compound detected in associated method blank

J - Estimated value.

NA - Sample not analyzed for the listed analyte.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in **Bold** indicate the compound was detected.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

BWSI - Below water-sediment interface.

Table A-5
Summary of Analytical Results for Eastern Storage Area Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**RA-27**		**RA-28**		**RA-29**	**RA-30**	**RA-31**	**RA-32**		**RA-33**	**RA-34**		**RA-41**
	Sample ID:	RA27-01	BERA-SS-09	RA28-01	BERA-SS-11	RA29-01	RA30-01	RA31-01	RA32-01	BERA-SS-12	RA33-01	RA34-01	BERA-SS-10	RA41-01
	Sample Depth (ft.):	0-0.5	0-1	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-1	0-0.5
	Sample Date:	10/30/1990	10/20/2011	10/30/1990	10/20/2011	10/29/1990	10/29/1990	10/30/1990	10/30/1990	10/20/2011	10/30/1990	10/30/1990	10/20/2011	10/30/1990
		^		^		^	^	^	^		^	^		^
VOCs														
(mg/kg)	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	R	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	R	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	R	NA	NA
SVOCs														
(mg/kg)	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.085 J**	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.210 JB**	NA	NA
PCBs														
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1.90**	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1.50 J**	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.00 U	NA	NA
	Total PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**3.40 J**	NA	NA
Metals, total														
(mg/kg)	Aluminum	**5,360**	NA	**42,900**	NA	**7,940**	**3,710**	**4,060**	**11,000**	NA	**13,100**	**28,700**	NA	**1,820**
	Antimony	12.5 U	NA	12.6 U	NA	12.3 U	12.3 U	**5.9 D**	**13.8**	NA	4.3 U	14.0 U	NA	12.1 U
	Arsenic	**1.3**	NA	**2.7**	NA	**1.2 D**	**4.2**	**1.6 D**	**1.6 D**	NA	**1.1 D**	**3.1**	NA	**1.0 D**
	Barium	**26.5 D**	NA	**166**	NA	**77.2**	**26.1 D**	**23.3 D**	**149**	NA	**650**	**400**	NA	**15.9 D**
	Beryllium	**2.3**	NA	**22.5**	NA	**6.3**	**2.1**	**0.68 D**	**1.9**	NA	**7.1**	**11.9**	NA	**5.5**
	Boron	20.9 U	NA	102	NA	37.9 U	20.5 U	20.5 U	**146**	NA	NA	**59.5**	NA	20.2 U
	Cadmium	1.0 U	NA	**0.91**	NA	**2.8**	1.0 U	1.0 U	1.0 U	NA	0.78 U	1.2 U	NA	1.0 U
	Calcium	**574 D**	NA	**49,500**	NA	**4,960**	**639 D**	**231 D**	**8,410**	NA	**7,050**	**71,900**	NA	**612 D**
	Chromium (total)	**57.6**	**132**	**368**	**54.0**	**130**	**421**	**67.2**	**469**	**124**	**113**	**148**	**30.3**	**147**
	Chromium (VI)	0.10 U	NA	**0.46**	NA	**0.82**	**1.6**	0.11 U	**2.7**	NA	**0.19**	0.12 U	NA	**0.14**
	Cobalt	**3.4 D**	NA	**19.0**	NA	**8.0 D**	**3.9 D**	**2.2 D**	**3.5 D**	NA	**12.2**	**6.1 D**	NA	10.1 U
	Copper	**12.2**	NA	**47.5**	NA	**21.9**	**6.4**	**2.8 D**	**10.8**	NA	**8.5**	**16.3**	NA	**5.1**
	Iron	**6,620**	NA	**27,100**	NA	**16,500**	**8,400**	**6,060**	**9,070**	NA	**2,460**	**5,100**	NA	**1,760**
	Lead	**19.3 D**	NA	**43.2**	NA	**80.0**	**25.6**	**11.4**	**46.0**	NA	**34.4**	**142**	NA	**11.2**
	Magnesium	**454 D**	NA	**26,000**	NA	**4,620**	**477 D**	**348 D**	**50,500**	NA	**8,290**	**33,800**	NA	**239 D**
	Manganese	**591**	NA	**2,830**	NA	**1,540**	**701**	**332**	**241**	NA	**269**	**543**	NA	**137**
	Mercury	0.096 U	NA	0.074 U	NA	0.087 U	0.096 U	0.089 U	0.11 U	NA	0.06 U	0.11 U	NA	0.095 U
	Nickel	**42.1**	NA	**1,110**	NA	**239**	**78.0**	**10.0**	**356**	NA	**534**	**299**	NA	**32.7**
	Niobium	40.8 U	NA	32.9 U	NA	36.5 U	41.7 U	41.1 U	40.7 U	NA	NA	46.7 U	NA	41.5 U
	Potassium	**577 D**	NA	**342 D**	NA	**169 D**	1,020 U	1,030 U	**1,110**	NA	**305 D**	**741 D**	NA	1,010 U
	Selenium	1.0 U	NA	1.1 U	NA	0.81 U	0.95 U	1.1 U	1.0 U	NA	0.42 U	11.7 U	NA	0.98 U
	Silver	2.1 U	NA	2.1 U	NA	2.1 U	2.1 U	2.1 U	2.0 U	NA	0.78 U	2.3 U	NA	2.0 U
	Sodium	**59.6 D**	NA	**217 D**	NA	**171 D**	**69.1 D**	**159 D**	**629 D**	NA	**618 D**	**1,520**	NA	**354 D**
	Strontium	20.9 U	NA	**117**	NA	20.5 U	20.5 U	20.5 U	22.8 U	NA	NA	**171**	NA	20.2 U
	Titanium	**142**	NA	**941**	NA	**416**	**151**	**119**	**154**	NA	NA	**256**	NA	**89.7**
	Vanadium	**453**	**286**	**4,750**	**159**	**1,270**	**390**	**102**	**436**	**169**	**1,510**	**2,450**	**60.6**	**715**
	Zinc	**30.5**	NA	**110**	NA	**148**	**29.0**	**110**	**41.6**	NA	**28.9**	**209**	NA	**13.0**
	Zirconium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**101**	NA	NA

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Table A-5
Summary of Analytical Results for Eastern Storage Area Soil Samples
SMC Facility
Newfield, New Jersey

	Sample Location:	**RA-27**		**RA-28**		**RA-29**	**RA-30**	**RA-31**	**RA-32**		**RA-33**	**RA-34**		**RA-41**
Analysis	Sample ID:	RA27-01	BERA-SS-09	RA28-01	BERA-SS-11	RA29-01	RA30-01	RA31-01	RA32-01	BERA-SS-12	RA33-01	RA34-01	BERA-SS-10	RA41-01
	Sample Depth (ft.):	0-0.5	0-1	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-1	0-0.5
	Sample Date:	10/30/1990 ^	10/20/2011	10/30/1990 ^	10/20/2011	10/29/1990 ^	10/29/1990 ^	10/30/1990 ^	10/30/1990 ^	10/20/2011	10/30/1990 ^	10/30/1990 ^	10/20/2011	10/30/1990 ^
General Chemistry														
(mg/kg)	Cyanide, Total	1.1 U	NA	1.1 U	NA	1.0 U	1.1 U	1.1 U	1.1 U	NA	NA	NA	NA	1.0 U

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
D - Detected below the quantitation limit and above the method detection limit
J - Estimated value; detected below quantitation limit.
N - Indicates presumptive evidence of a compound.
NA - Sample not analyzed for the listed analyte.
ND - Not detected with unknown quantitation limit.
R - Rejected during data review.
NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.
U - Compound was not detected at specified quantitation limit.
UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
^ - Data not QC'd by TRC.

Table A-5
Summary of Analytical Results for Eastern Storage Area Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**RA-42**	**RA-49**	**RA-49**	**RA-50**	**RA-50**	**RA-51**	**RA-52**	**RA-56**	**RA-57**	**SB-20**	**SB-20**	**SB-21**	**SB-22**
	Sample ID:	RA42-01	RA49-01	BERA-SS-13	RA50-01	BERA-SS-14	RA51-01	RA52-01	RA56-01	RA57-01	SB20-01	SB-20-1	SB21-01	SB22-01
	Sample Depth (ft.):	0-0.5	0-0.5	0-1	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-2	0-2	0-2	0-2
	Sample Date:	10/30/1990 ^	10/30/1990 ^	10/19/2011	10/30/1990 ^	10/19/2011	10/30/1990 ^	10/30/1990 ^	10/30/1990 ^	10/30/1990 ^	11/6/1990	8/9/1995	11/9/1990	11/6/1990
VOCs														
(mg/kg)	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs														
(mg/kg)	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs														
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	0.036 U	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	0.036 U	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.022 J**	0.036 U	NA	NA
	Total PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.022 J**	0.036 U	NA	NA
Metals, total														
(mg/kg)	Aluminum	**17,900**	**67,200**	NA	**91,300**	NA	**1,580**	**952**	**6,120**	**4,530**	**7,950**	NA	**10,400**	**6,030**
	Antimony	12.1 U	12.5 U	NA	12.9 U	NA	12.8 U	12.3 U	12.5 U	12.1 U	12.8 U	NA	12.6 U	12.2 U
	Arsenic	**2.0 D**	**2.9**	NA	**3.1 D**	NA	**1.5 D**	**0.79 D**	**1.3 D**	2.0 U	**4.7**	NA	**1.2 D**	**1.1 D**
	Barium	**121**	**212.5**	NA	**683**	NA	**10.9 D**	**9.3 D**	**51.2**	40.5 U	**152**	NA	**71.8**	**44.4**
	Beryllium	**13.0**	**35.5**	NA	**18.8**	NA	**0.28 D**	1.0 U	**1.8**	1.0 U	**5.7**	NA	**7.7**	**0.59 D**
	Boron	20.2 U	**171.5**	NA	**208**	NA	21.4 U	20.5 U	20.8 U	20.2 U	21.3 U	NA	NA	20.3 U
	Cadmium	1.0 U	1.0 U	NA	1.1 U	NA	1.1 U	1.0 U	1.0 U	1.0 U	**1.7**	NA	1.0 U	1.0 U
	Calcium	**13,300**	**78,800**	NA	**103,000**	NA	**73.0 D**	**58.3 D**	**1,960**	1,010 U	**13,100**	NA	**7,690**	**269 D**
	Chromium (total)	**295**	**157.5**	**2.3**	**176**	**19.7**	**12.5**	**2.4**	**39.2**	**11.3**	**143**	NA	**162**	**32.7**
	Chromium (VI)	**0.34**	0.11 U	NA	0.11 U	NA	0.11 U	0.11 U	0.11 U	0.11 U	**0.85**	NA	R	**0.66**
	Cobalt	**8.0 D**	**7.3 D**	NA	**4.3 D**	NA	10.7 U	10.3 U	**4.0 D**	10.1 U	**9.7 D**	NA	**10.0 D**	**2.6 D**
	Copper	**73.7**	**32.1**	NA	**14.3**	NA	**2.6 D**	**1.7 D**	**7.4**	**7.5**	**342**	NA	**49.4**	**3.6 D**
	Iron	**25,400**	**6,610**	NA	**4,280**	NA	**3,480**	**1,610**	**7,410**	**7,500**	**18,900**	NA	**15,000**	**7,610**
	Lead	**41.4**	**70.1**	NA	**96.7**	NA	**8.2 D**	**4.6**	**58.4**	**21.5**	**3.62**	NA	**68.3**	**4.1**
	Magnesium	**6,650**	**31,200**	NA	**45,800**	NA	**181 D**	**107 D**	**989 D**	1,010 U	**4,070**	NA	**6,330**	**640 D**
	Manganese	**1,060**	**409**	NA	**337**	NA	**10.0**	**6.3**	**222**	**148**	**1,510**	NA	**3,150**	**85.7**
	Mercury	0.097 U	0.08 U	NA	0.10 U	NA	0.10 U	0.097 U	0.099 U	0.11 U	0.085 U	NA	0.081 U	0.093 U
	Nickel	**326**	**595**	NA	**144**	NA	**3.3 D**	**2.2 D**	**28.1**	8.1 U	**322**	NA	**463**	**11.4**
	Niobium	**69.7**	**46.35 J**	NA	**52.0**	NA	39.8 U	40.9 U	41.6 U	40.5 U	42.6 U	NA	NA	40.6 U
	Potassium	1,010 U	1,040 U	NA	1,080 U	NA	1,070 U	1,030 U	**208 D**	1,010 U	**556 D**	NA	**389 D**	**375 D**
	Selenium	1.0 U	10.8 U	NA	11.0 U	NA	**0.42 D**	1.1 U	1.1 U	1.0 U	1.1 U	NA	1.0 U	1.1 U
	Silver	2.0 U	2.1 U	NA	2.2 U	NA	2.1 U	2.1 U	2.1 U	2.0 U	2.1 U	NA	2.1 U	2.0 U
	Sodium	**253 D**	**457 D**	NA	**546 D**	NA	**116 D**	**122 D**	**152 D**	1,010 U	**206 D**	NA	**195 D**	**332 D**
	Strontium	26.5 U	**118**	NA	228 U	NA	21.4 U	20.5 U	20.8 U	20.2 U	**110**	NA	NA	20.3 U
	Titanium	**246**	**150**	NA	**190**	NA	**78.3**	**52.2**	**150**	**142**	**341**	NA	NA	**133**
	Vanadium	**1,770**	**4,875**	5.1 U	**2,660**	**40.8**	**36.0**	**15.0**	**208**	**49.4**	**1,160**	NA	**1,810**	**82.9**
	Zinc	**72.0**	**50.4**	NA	**89.0**	NA	**6.9**	**6.0**	**335**	**112**	**59.8**	NA	**286**	**23.7**
	Zirconium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table A-5
Summary of Analytical Results for Eastern Storage Area Soil Samples
SMC Facility
Newfield, New Jersey

	Sample Location:	**RA-42**	**RA-49**	**RA-49**	**RA-50**		**RA-51**	**RA-52**	**RA-56**	**RA-57**	**SB-20**		**SB-21**	**SB-22**
Analysis	Sample ID:	RA42-01	RA49-01	BERA-SS-13	RA50-01	BERA-SS-14	RA51-01	RA52-01	RA56-01	RA57-01	SB20-01	SB-20-1	SB21-01	SB22-01
	Sample Depth (ft.):	0-0.5	0-0.5	0-1	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-2	0-2	0-2	0-2
	Sample Date:	10/30/1990	10/30/1990	10/19/2011	10/30/1990	10/19/2011	10/30/1990	10/30/1990	10/30/1990	10/30/1990	11/6/1990	8/9/1995	11/9/1990	11/6/1990
		^	^		^		^	^	^	^				
General Chemistry														
(mg/kg)	Cyanide, Total	**0.52**	**0.5825**	NA	1.1 U	NA	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	NA	1.1 U	1.1 U

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
D - Detected below the quantitation limit and above the method detection limit
J - Estimated value; detected below quantitation limit.
N - Indicates presumptive evidence of a compound.
NA - Sample not analyzed for the listed analyte.
ND - Not detected with unknown quantitation limit.
R - Rejected during data review.
NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.
U - Compound was not detected at specified quantitation limit.
UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
^ - Data not QC'd by TRC.

Table A-5
Summary of Analytical Results for Eastern Storage Area Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SB-22**	**SB-23**		**SB-26**	**SB-28**	**SB-32**	**SB-33**	**SS-13**	**SS-14**
	Sample ID:	SB-22-1	SB23-01	SB-23-1	SB26-01	SB28-01	SB32-01	SB33-01	SS-13	SS-14
	Sample Depth (ft.):	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-1	0-1
	Sample Date:	8/9/1995	11/12/1990 combo	8/8/1995	11/12/1990	11/12/1990	11/8/1990	11/8/1990	8/7/1995	8/7/1995
VOCs										
(mg/kg)	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs										
(mg/kg)	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs										
(mg/kg)	Aroclor-1248	0.036 U	NA	NA	NA	NA	ND	ND	0.035 U	0.036 U
	Aroclor-1254	0.036 U	NA	NA	NA	NA	**0.13**	**0.016 J**	0.035 U	**0.064**
	Aroclor-1260	0.036 U	NA	NA	NA	NA	ND	ND	0.035 U	ND
	Total PCBs	0.036 U	NA	NA	NA	NA	**0.13**	**0.016 J**	0.035 U	**0.064**
Metals, total										
(mg/kg)	Aluminum	NA	**4,525**	NA	**6,040**	**104,000**	**3,890**	**4,910**	NA	NA
	Antimony	NA	**5.45 J**	NA	4.0 U	3.9 U	12.4 U	12.2 U	NA	NA
	Arsenic	NA	**0.61 D**	NA	**1.1 D**	**2.6 D**	**1.1 D**	**1.1 D**	NA	NA
	Barium	NA	**20.0 D**	NA	**28.4 D**	**228**	**30.8 D**	**26.3 D**	NA	NA
	Beryllium	NA	**0.29 D**	**0.41**	R	R	**7.8**	**1.1**	NA	NA
	Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Cadmium	NA	0.66 U	NA	0.62 U	0.61 U	1.0 U	1.0 U	NA	NA
	Calcium	NA	**206.5 D**	NA	**1,930**	**115,000**	**1,010 D**	**891 D**	NA	NA
	Chromium (total)	NA	**51.0**	**40.7 N**	R	R	**1,100**	**180**	NA	NA
	Chromium (VI)	NA	0.11 U	NA	0.10 U	0.10 U	**0.79**	0.10 U	NA	NA
	Cobalt	NA	**1.185 J**	NA	0.91 U	**3.3 D**	**3.3 D**	**3.3 D**	NA	NA
	Copper	NA	**3.2 D**	NA	**1.5 D**	**33.6**	**13.1**	**5.1 D**	NA	NA
	Iron	NA	**8,045**	NA	**5,410**	**1,670**	**8,210**	**8,480**	NA	NA
	Lead	NA	**10.7 D**	NA	**6.0**	**70.4**	**331**	**15.4**	NA	NA
	Magnesium	NA	**609.5 D**	NA	**754 D**	**43,000**	**707 D**	**683 D**	NA	NA
	Manganese	NA	**46.8**	NA	**25.3**	**113**	**565**	**236**	NA	NA
	Mercury	NA	**0.09**	NA	0.11 U	0.08 U	0.10 U	0.087 U	NA	NA
	Nickel	NA	**9.4**	NA	**2.0 D**	**469**	**108**	**36.4**	NA	NA
	Niobium	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Potassium	NA	**409.5 D**	NA	**206 D**	155 U	**285 D**	**191 D**	NA	NA
	Selenium	NA	0.42 U	NA	R	R	1.0 U	0.99 U	NA	NA
	Silver	NA	2.4 U	NA	R	R	2.1 U	**2.3**	NA	NA
	Sodium	NA	**290 D**	NA	**505 D**	**1,020**	**268 D**	**187 D**	NA	NA
	Strontium	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Vanadium	NA	**60.5**	NA	**14.1**	**3,630**	**1,190**	**145**	NA	NA
	Zinc	NA	**7.0**	NA	**9.7**	**49.1**	**243**	**14.2**	NA	NA
	Zirconium	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table A-5
Summary of Analytical Results for Eastern Storage Area Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SB-22**	**SB-23**		**SB-26**	**SB-28**	**SB-32**	**SB-33**	**SS-13**	**SS-14**
	Sample ID:	SB-22-1	SB23-01	SB-23-1	SB26-01	SB28-01	SB32-01	SB33-01	SS-13	SS-14
	Sample Depth (ft.):	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-1	0-1
	Sample Date:	8/9/1995	11/12/1990 combo	8/8/1995	11/12/1990	11/12/1990	11/8/1990	11/8/1990	8/7/1995	8/7/1995
General Chemistry										
(mg/kg)	Cyanide, Total	NA	1.1 U	NA	1.1 U	1.0 U	1.1 U	1.0 U	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
D - Detected below the quantitation limit and above the method detection limit
J - Estimated value; detected below quantitation limit.
N - Indicates presumptive evidence of a compound.
NA - Sample not analyzed for the listed analyte.
ND - Not detected with unknown quantitation limit.
R - Rejected during data review.
NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.
U - Compound was not detected at specified quantitation limit.
UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
^ - Data not QC'd by TRC.

Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**RA-03**	**RA-04**	**RA-05**		**RA-06**	**RA-11**	**RA-12**	**RA-13**	**RA-14**			**RA-25**	**RA-36**	**RA-37**	**RA-40**
	Sample ID:	RA03-01	RA04-01	RA05-01	BERA-SS-03	RA06-01	RA11-01	RA12-01	RA13-01	RA14-01		BERA-SS-01	RA25-01	RA36-01	RA37-01	RA40-01
	Sample Depth (ft.):	0-0.5	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5
	Sample Date:	10/30/1990 *	10/30/1990 *	10/30/1990 *	10/20/2011	10/30/1990 *	10/30/1990 *	10/30/1990 *	10/30/1990 *	10/30/1990 *	2/19/1991 *	10/21/2011	10/30/1990 *	10/30/1990 *	10/30/1990 *	10/30/1990 *
SVOCs																
(mg/kg)	Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(ghi)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs																
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides																
(mg/kg)	Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals, total																
(mg/kg)	Aluminum	**3,760**	**3,920**	**7,260**	NA	**1,500**	**2,300**	**37,400**	**7,120**	**8,720**	NA	NA	**2,710**	**1,660**	**1,180**	**2,020**
	Antimony	15.2 U	15.8 U	13.5 U	NA	16.7 U	17.1 U	44.6 U	23.6 U	15.4 U	NA	NA	12.7 U	**6.2 D**	**7.0 D**	15.7 U
	Arsenic	**3.1**	**2.7**	**4.5**	NA	**1.0 D**	**3.1**	**4.0**	**6.2**	**4.2 D**	NA	NA	**1.1 D**	**0.74 D**	**0.95 D**	**1.7 D**
	Barium	**19.9 D**	**24.3 D**	**57.8**	NA	**15.2 D**	**44.2 D**	**739**	**56.3 D**	**182**	NA	NA	**18.5 D**	**6.5 D**	**8.0 D**	**11.6 D**
	Beryllium	1.3 U	1.3 U	**1.4**	NA	1.4 U	**2.1**	**60.1**	**6.8**	**12.8**	NA	NA	**0.46 D**	**0.30 D**	**0.36 D**	**0.34 D**
	Cadmium	1.3 U	1.3 U	1.1 U	NA	1.4 U	1.4 U	**5.3**	2.0 U	**1.6**	NA	NA	1.1 U	0.99 U	1.2 U	1.3 U
	Calcium	**210 D**	**186 D**	**750 D**	NA	**431 D**	**1,400 D**	**7,320**	**3,130**	**3,670**	NA	NA	**828 D**	**107 D**	**111 D**	**219 D**
	Chromium (total)	**5.1**	**12.2**	**29.7**	**22.0**	**36.2**	**45.1**	**5,870**	**123**	**218**	NA	**34**	**8.1**	**3.0**	**16.3**	**10.7**
	Chromium (VI)	0.14 U	0.14 U	0.16 U	NA	0.15 U	0.15 U	0.43 U	**0.38**	NA	0.14 U	NA	0.11 U	0.10 U	0.12 U	0.13 U
	Cobalt	12.6 U	13.2 U	**1.7 D**	NA	13.9 U	14.2 U	**87.1**	**3.1**	**19.5**	NA	NA	10.6 U	9.9 U	11.8 U	13.1 U
	Copper	**39.5**	**19.7**	**8.6**	NA	**5.5 D**	**5.5 D**	**887**	**17.6**	**33.6**	NA	NA	**2.5 D**	**1.2 D**	**2.8 D**	**3.3 D**
	Iron	**7,290**	**8,010**	**10,300**	NA	**1,790**	**5,750**	**32,300**	**12,000**	**9,050**	NA	NA	**3,570**	**2,540**	**1,530**	**2,400**
	Lead	**49.2**	**93.0**	**76.4**	NA	**49.4**	**40.8**	**760**	**319**	**257**	NA	NA	**26.1**	**2.9 D**	**11.2**	**16.8**
	Magnesium	**114 D**	**221 D**	**572 D**	NA	**202 D**	**1,720**	**4,380**	**2,980**	**3,680**	NA	NA	**361 D**	**190 D**	**146 D**	**193 D**
	Manganese	**24.1**	**37.0**	**26.6**	NA	**102**	**71.0**	**1,680**	**354**	**1,110**	NA	NA	**123**	**37.5**	**47.9**	**101**
	Mercury	**0.24**	**0.23**	**0.27**	NA	**0.52**	0.099 U	**0.51**	**0.44**	**0.17**	NA	NA	**0.14**	0.077 U	0.12 U	0.12 U
	Nickel	**3.9 D**	**7.5 D**	**26.9**	NA	**9.0 D**	**17.8**	**3,360**	**90.4**	**1,290**	NA	NA	**9.1**	**4.1 D**	**4.2 D**	**5.6 D**

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Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**RA-03**	**RA-04**	**RA-05**		**RA-06**	**RA-11**	**RA-12**	**RA-13**	**RA-14**			**RA-25**	**RA-36**	**RA-37**	**RA-40**
	Sample ID:	RA03-01	RA04-01	RA05-01	BERA-SS-03	RA06-01	RA11-01	RA12-01	RA13-01	RA14-01		BERA-SS-01	RA25-01	RA36-01	RA37-01	RA40-01
	Sample Depth (ft.):	0-0.5	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5
	Sample Date:	10/30/1990	10/30/1990	10/30/1990	10/20/2011	10/30/1990	10/30/1990	10/30/1990	10/30/1990	10/30/1990	2/19/1991	10/21/2011	10/30/1990	10/30/1990	10/30/1990	10/30/1990
		*	*	*		*	*	*	*	*	*		*	*	*	*
	Potassium	1,260 U	1,320 U	**516 D**	NA	1,400 U	**480 D**	**1,040 D**	**845 D**	**257 D**	NA	NA	1,060 U	989 U	1,180 U	1,310 U
	Selenium	1.1 U	**0.44 D**	1.6 U	NA	1.3 U	1.3 U	4.0 U	2.0 U	**0.51 D**	NA	NA	1.1 U	1.0 U	1.2 U	1.2 U
	Silver	2.5 U	2.6 U	2.2 U	NA	2.8 U	2.8 U	7.4 U	3.9 U	2.6 U	NA	NA	2.1 U	2.0 U	2.4 U	2.6 U
	Sodium	**42.4 D**	**50.6 D**	**171 D**	NA	**36.9 D**	**184 D**	**349 D**	**218 D**	**163 D**	NA	NA	**23.8 D**	**160 D**	**250 D**	**222 D**
	Thallium	2.1 U	2.0 U	3.1 U	NA	2.5 U	2.7 U	8.0 U	4.0 U	2.5 U	NA	NA	21.4 U	2.0 U	2.4 U	2.5 U
	Titanium	**106**	**127**	**159**	NA	**78.1**	**51.5**	**1,480**	**197**	**197**	NA	NA	**94.4**	**55.2**	**53.6**	**66.2**
	Vanadium	**12.7**	**38.8**	**203**	**60.0**	**36.4**	**403**	**12,100**	**1,360**	**2,560**	NA	**138**	**61.8**	**35.9**	**65.3**	**47.7**
	Zinc	**20.4**	**27.8**	**31.1**	NA	**22.5**	**56.5**	**1,310**	**87.0**	**355**	NA	NA	**18.8**	**10.0**	**10.4**	**21.4**
General Chemistry																
(mg/kg)	Total Organic Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
(s.u.)	pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
D - Detected below the quantitation limit and above the method detection limit
J - Estimated value; detected below quantitation limit.
N - Indicates presumptive evidence of a compound.
NA - Sample not analyzed for the listed analyte.
ND - Not detected with unknown quantitation limit.
R - Rejected during data review.
NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.
U - Compound was not detected at specified quantitation limit.
UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
^ - Data not QC'd by TRC.

Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**RA-46**	**RA-48**	**SS-16**	**SS-17**	**SS-18**	**SS-19**	**SS-19**	**SS-20**	**SS-21**	**SS-23**	**SS-24**	**SS-28**	**SD-100B**	**SD-100C**	**SD-101B**
	Sample ID:	RA46-01	RA48-01	SS-16	SS-17	SS-18	SS-19	BERA-SS-02	SS-20	SS-21	SS-23	SS-24	SS-28	SD-100B	SD-100C	SD-101B
	Sample Depth (ft.):	0-0.5	0-0.5	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-0.5	0-0.5	0-0.5
	Sample Date:	10/30/1990 *	10/30/1990 *	8/7/1995	8/7/1995	8/7/1995	8/7/1995	10/20/2011	8/7/1995	8/7/1995	8/7/1995	8/7/1995	8/10/1995	4/11/1996	4/11/1996	4/11/1996
SVOCs																
(mg/kg)	Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(ghi)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs																
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides																
(mg/kg)	Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals, total																
(mg/kg)	Aluminum	**1,710**	**1,230**	**724**	**979**	**1,230**	**3,340**	NA	**782**	**2,760**	**2,670**	**2,140**	**1,090**	NA	NA	NA
	Antimony	13.7 U	13.1 U	3.8 U	**4.7**	3.9 U	3.6 U	NA	3.9 U	3.1 U	3.4 U	3.3 U	2.8 U	NA	NA	NA
	Arsenic	**2.1 D**	**0.93 D**	0.25 U	**1.3**	**3.7**	**1.35**	NA	**0.70**	**2.3**	**2.3**	**1.6**	**2.1**	NA	NA	NA
	Barium	**7.1 D**	**4.3 D**	**21.0**	**4.1**	**10.3**	**40.4**	NA	**6.8**	**18.5**	**12.8**	**14.5**	**4.3**	NA	NA	NA
	Beryllium	**0.34 D**	1.1 U	**0.43**	**0.16**	**0.51**	**3.105**	NA	**0.67**	**0.13**	**0.28**	**0.19**	**0.10**	NA	NA	NA
	Cadmium	1.1 U	1.1 U	0.44 U	0.42 U	0.44 U	**0.41**	NA	0.44 U	0.35 U	0.39 U	0.37 U	0.30 U	NA	NA	NA
	Calcium	**43.3 D**	**40.6 D**	**981**	**60.6**	**110**	**1,433**	NA	**228**	**1,750**	**1,090**	**845**	**35.9**	NA	NA	NA
	Chromium (total)	**9.1**	**5.4**	**8.3**	**3.7**	**11.1**	**45.75**	**2,310**	**18.8**	**11.6**	**8.6**	**9.5**	**7.7**	**1,470**	**2,610**	**710**
	Chromium (VI)	0.12 U	0.12 U	**1.1**	**5.3**	1.1 U	**1.8 J**	NA	1.4 U	0.23 U	0.25 U	0.24 U	0.52 U	NA	NA	NA
	Cobalt	11.4 U	10.9 U	0.41 U	0.39 U	**0.61**	**2.325**	NA	0.41 U	**0.43**	**0.39**	**1.00**	**0.40**	NA	NA	NA
	Copper	**2.5 D**	**2.4 D**	**7.7**	**4.2**	**4.8**	**8.95**	NA	**1.8**	**8.0**	**4.4**	**3.8**	**1.7**	**36.3 D**	**64.9**	**11.2 D**
	Iron	**3,610**	**1,430**	**773**	**2,010**	**2,450**	**5,815**	NA	**669**	**3,030**	**5,050**	**2,380**	**2,350**	NA	NA	NA
	Lead	**19.8**	**7.2**	**18.6**	**13.4**	**39.9**	**64.5**	NA	**14.9**	**20.4**	**17.3**	**14.4**	**14.3**	NA	NA	NA
	Magnesium	**135 D**	**117 D**	**177**	**67.3**	**91.0**	**897**	NA	**106**	**222**	**103**	**83.2**	**46.1**	NA	NA	NA
	Manganese	**7.0**	**4.3**	**89.0**	**4.2**	**37.0**	**166.45**	NA	**22.9**	**123**	**78.3**	**100**	**6.3**	NA	NA	NA
	Mercury	0.12 U	0.11 U	**0.07**	**0.16**	**0.21**	**0.085**	NA	**0.10**	**0.31**	**0.38**	**0.19**	**0.09**	NA	NA	NA
	Nickel	9.2 U	8.7 U	**7.3**	0.92 U	**4.9**	**83.85**	NA	**5.3**	**4.0**	**2.4**	**3.4**	**1.9**	**60.8 D**	**91.3**	**28.8 D**

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Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**RA-46**	**RA-48**	**SS-16**	**SS-17**	**SS-18**	**SS-19**	**SS-19**	**SS-20**	**SS-21**	**SS-23**	**SS-24**	**SS-28**	**SD-100B**	**SD-100C**	**SD-101B**
	Sample ID:	RA46-01	RA48-01	SS-16	SS-17	SS-18	SS-19	BERA-SS-02	SS-20	SS-21	SS-23	SS-24	SS-28	SD-100B	SD-100C	SD-101B
	Sample Depth (ft.):	0-0.5	0-0.5	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-0.5	0-0.5	0-0.5
	Sample Date:	10/30/1990 *	10/30/1990 *	8/7/1995	8/7/1995	8/7/1995	8/7/1995	10/20/2011	8/7/1995	8/7/1995	8/7/1995	8/7/1995	8/10/1995	4/11/1996	4/11/1996	4/11/1996
	Potassium	1,140 U	1,090 U	**140**	**153**	**341**	**242**	NA	81.0 U	**147**	**76.3**	**147**	59.4 U	NA	NA	NA
	Selenium	1.1 U	**0.47 D**	**0.16**	**0.40**	**0.62**	**0.255**	NA	**0.31**	**0.16**	**0.30**	**0.22**	0.13 U	NA	NA	NA
	Silver	2.3 U	**1.5 D**	0.35 U	**0.43**	0.36 U	0.33 U	NA	0.36 U	0.28 U	0.31 U	0.30 U	0.26 U	NA	NA	NA
	Sodium	**195 D**	**174 D**	**109**	**598**	**84.1**	**407**	NA	**158**	**61.3**	**331**	**155**	**44.5**	NA	NA	NA
	Thallium	2.3 U	2.2 U	0.28 U	0.27 U	**0.37**	0.26 U	NA	0.28 U	0.23 U	0.25 U	0.24 U	0.21 U	NA	NA	NA
	Titanium	**76.7**	**42.5**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Vanadium	**40.5**	**31.0**	**44.4**	**17.3**	**62.6**	**571**	**481**	**83.9**	**19.7**	**22.4**	**22.4**	**12.7**	**679**	**1,030**	**290**
	Zinc	**10.6**	**6.3**	**23.4**	**6.0**	**9.6**	**46.1**	NA	**8.2**	**30.7**	**23.6**	**22.3**	**4.8**	NA	NA	NA
General Chemistry																
(mg/kg)	Total Organic Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
(s.u.)	pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**4.0**	NA	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
D - Detected below the quantitation limit and above the method detection limit
J - Estimated value; detected below quantitation limit.
N - Indicates presumptive evidence of a compound.
NA - Sample not analyzed for the listed analyte.
ND - Not detected with unknown quantitation limit.
R - Rejected during data review.
NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.
U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
^ - Data not QC'd by TRC.

Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SD-101B**	**SD-101C**	**SD-102A**		**SD-102B**	**SD-103A**		**SD-103B**	**SD-103C**	**SD-104A**	**SD-104B**	**SD-105A**	**SD-105D**		**SD-106A**
	Sample ID:	BERA-SS-08	SD-101C	SD-102A	BERA-SS-07	SD-102B	SD-103A	BERA-SS-06	SD-103B	SD-103C	SD-104A	SD-104B	SD-105A	SD-105D	BERA-SS-05	SD-106A
	Sample Depth (ft.):	0-1	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-1	0-0.5
	Sample Date:	10/20/2011	4/11/1996	4/11/1996	10/20/2011	4/11/1996	4/11/1996	10/20/2011	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	10/20/2011	4/11/1996
SVOCs																
(mg/kg)	Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(ghi)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs																
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides																
(mg/kg)	Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals, total																
(mg/kg)	Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Chromium (total)	**87.7**	**4,530**	**523**	**357**	**114**	**766**	**4.7**	**429**	**428**	**8,940**	**213**	**463**	**156**	**6.0**	**222**
	Chromium (VI)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Copper	NA	**60.9**	**48.0**	NA	**21.8 D**	**21.1 D**	NA	**17.8 D**	**16.8 D**	**126**	**37.5**	**38.0**	**17.0 D**	NA	**49.2**
	Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Nickel	NA	**162**	**83.0**	NA	**26.4 D**	**29.9 D**	NA	**43.0 D**	9.3 U	**44.1**	**38.4**	**61.5**	**38.6 D**	NA	**28.9**

Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SD-101B**	**SD-101C**	**SD-102A**		**SD-102B**	**SD-103A**		**SD-103B**	**SD-103C**	**SD-104A**	**SD-104B**	**SD-105A**	**SD-105D**		**SD-106A**
	Sample ID:	BERA-SS-08	SD-101C	SD-102A	BERA-SS-07	SD-102B	SD-103A	BERA-SS-06	SD-103B	SD-103C	SD-104A	SD-104B	SD-105A	SD-105D	BERA-SS-05	SD-106A
	Sample Depth (ft.):	0-1	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-1	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-1	0-0.5
	Sample Date:	10/20/2011	4/11/1996	4/11/1996	10/20/2011	4/11/1996	4/11/1996	10/20/2011	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	4/11/1996	10/20/2011	4/11/1996
	Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Vanadium	**131**	**1,420**	**588**	**354**	**199**	**529**	5.0 U	**386**	**403**	**171**	**349**	**665**	**777**	**16.3**	**473**
	Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
General Chemistry																
(mg/kg)	Total Organic Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
(s.u.)	pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
D - Detected below the quantitation limit and above the method detection limit
J - Estimated value; detected below quantitation limit.
N - Indicates presumptive evidence of a compound.
NA - Sample not analyzed for the listed analyte.
ND - Not detected with unknown quantitation limit.
R - Rejected during data review.
NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260. Aroclor 1254 is the predominant PCB; however, the reported value is based on peaks common to both Aroclors.
U - Compound was not detected at specified quantitation limit.
UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
^ - Data not QC'd by TRC.

Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SD-106C**	**SD-107A**		**SD-107B**	**SD-01N**	**SD-01S**	**SD-04N**	**SD-04N-X**	**SD-04S**	**SD-10N**	**SD-10S**	**SD-13N**	**SD-13N-X**	**SD-13S**	**SD-15I**
	Sample ID:	SD-106C	SD-107A	BERA-SS-04	SD-107B	SD-01N	SD-01S	SD-04N	SD-04N-X	SD-04S	SD-10N	SD-10S	SD-13N	SD-13N-X	SD-13S	SD-15I
	Sample Depth (ft.):	0-0.5	0-0.5	0-1	0-0.5	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BG
	Sample Date:	4/11/1996	4/11/1996	10/20/2011	4/11/1996	10/13/2011	10/13/2011	10/6/2011	1/31/2012	10/6/2011	10/12/2011	10/12/2011	10/11/2011	1/30/2012	10/11/2011	10/7/20
SVOCs																
(mg/kg)	Acenaphthylene	NA	NA	NA	NA	0.033 U	0.033 U	0.052 U	0.032 U	0.056 U	**0.149**	0.031 U	0.042 U	0.032 U	**0.0406 J**	0.044
	Anthracene	NA	NA	NA	NA	0.033 U	0.033 U	0.052 U	0.032 U	0.056 U	**0.102**	0.031 U	0.042 U	0.032 U	**0.0319 J**	0.044
	Benzo(a)anthracene	NA	NA	NA	NA	**0.0277 J**	0.033 U	0.052 U	R	**0.0238 J**	**0.126**	**0.0145 J**	**0.0193 J**	**0.0199 J**	**0.141**	**0.0185**
	Benzo(a)pyrene	NA	NA	NA	NA	**0.0439**	0.033 U	0.052 U	0.032 U	0.056 U	**0.127**	0.031 U	0.042 U	**0.0182 J**	**0.156**	0.044
	Benzo(b)fluoranthene	NA	NA	NA	NA	**0.0882**	0.033 U	0.052 U	0.032 U	0.056 U	**0.151**	**0.0163 J**	0.042 U	**0.0207 J**	**0.127**	0.044
	Benzo(ghi)perylene	NA	NA	NA	NA	**0.0353**	0.033 U	0.052 U	0.032 U	0.056 U	**0.107**	0.031 U	0.042 U	**0.0128 J**	**0.117**	0.044
	Benzo(k)fluoranthene	NA	NA	NA	NA	**0.0299 J**	0.033 U	0.052 U	0.032 U	0.056 U	**0.0378**	0.031 U	0.042 U	0.032 U	**0.141**	0.044
	Benzaldehyde	NA	NA	NA	NA	0.16 U	0.16 U	**0.121 J**	0.16 U	**0.0736 J**	0.15 U	0.15 U	0.21 U	0.16 U	0.22 U	0.22
	Carbazole	NA	NA	NA	NA	0.066 U	0.066 U	0.1 U	0.064 U	0.11 U	0.062 U	0.062 U	0.083 U	0.064 U	0.087 U	0.088
	Chrysene	NA	NA	NA	NA	**0.0473**	0.033 U	0.052 U	R	**0.0282 J**	**0.176**	**0.0151 J**	**0.0251 J**	**0.0191 J**	**0.178**	**0.0223**
	Dibenz(a,h)anthracene	NA	NA	NA	NA	0.033 U	0.033 U	0.052 U	0.032 U	0.056 U	**0.0227 J**	0.031 U	0.042 U	0.032 U	0.043 U	0.044
	Dimethyl phthalate	NA	NA	NA	NA	0.066 U	0.066 U	**0.0708 BJ**	0.064 U	**0.103 BJ**	0.062 U	0.062 U	0.083 U	**0.0492 JB**	**0.0966**	**0.121**
	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	0.066 U	0.066 U	0.1 U	R	0.11 U	0.062 U	**0.0438 J**	0.083 U	0.064 U	0.087 U	0.088
	Fluoranthene	NA	NA	NA	NA	**0.0218 J**	0.033 U	0.052 U	0.032 U	**0.0398 J**	**0.209**	**0.018 J**	**0.0284 J**	**0.0336**	**0.255**	**0.0381**
	Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	**0.0331**	0.033 U	0.052 U	0.032 U	0.056 U	**0.0798**	0.031 U	0.042 U	0.032 U	**0.116**	0.044
	Phenanthrene	NA	NA	NA	NA	0.033 U	0.033 U	0.052 U	0.032 U	0.056 U	**0.201**	0.031 U	**0.0277 J**	**0.0218 J**	**0.0917**	**0.0247**
	Pyrene	NA	NA	NA	NA	**0.0354**	0.033 U	0.052 U	R	**0.042 J**	**0.349**	**0.0211 J**	**0.036 J**	**0.0314 J**	**0.265**	**0.0396**
PCBs																
(mg/kg)	Aroclor-1248	NA	NA	NA	NA	0.034 U	0.034 U	0.054 U	0.033 U	0.058 U	0.032 U	0.032 U	0.043 U	0.032 U	0.045 U	0.046
	Aroclor-1254	NA	NA	NA	NA	0.034 U	0.034 U	0.054 U	0.033 U	0.058 U	0.032 U	0.032 U	0.043 U	0.032 U	0.045 U	**0.0498**
	Aroclor-1260	NA	NA	NA	NA	0.034 U	0.034 U	0.054 U	0.033 U	0.058 U	0.032 U	0.032 U	0.043 U	**0.244**	0.045 U	**0.0596**
	Total PCBs	NA	NA	NA	NA	0.034 U	0.034 U	0.054 U	0.033 U	0.058 U	0.032 U	0.032 U	0.043 U	**0.244**	0.045 U	**0.1094**
Pesticides																
(mg/kg)	Aldrin	NA	NA	NA	NA	0.00068 U	0.00068 U	0.0011 U	0.00065 U	0.0012 U	0.00064 U	0.00063 U	0.00086 U	0.00064 U	0.0009 U	0.00092
	Dieldrin	NA	NA	NA	NA	0.00068 U	0.00068 U	0.0011 U	0.00065 U	0.0012 U	0.00064 U	0.00063 U	0.00086 U	0.00064 U	0.0009 U	0.00092
	4,4'-DDD	NA	NA	NA	NA	**0.0032**	0.00068 U	**0.0031**	0.00065 U	**0.0025**	0.00064 U	0.00063 U	0.00086 U	0.00064 U	0.0009 U	0.00092
	4,4'-DDE	NA	NA	NA	NA	**0.0346**	0.00068 U	**0.0051**	0.00065 U	**0.0105**	0.00064 U	**0.0015**	**0.0031**	0.00064 U	0.0009 U	0.00092
	4,4'-DDT	NA	NA	NA	NA	**0.0274**	0.00068 U	0.0011 U	0.00065 U	**0.0102**	**0.0034**	0.00063 U	**0.0029**	0.00064 U	0.0009 U	0.00092
	Endosulfan sulfate	NA	NA	NA	NA	0.00068 U	0.00068 U	0.0011 U	0.00065 U	0.0012 U	0.00064 U	0.00063 U	0.00086 U	0.00064 U	0.0009 U	0.00092
Metals, total																
(mg/kg)	Aluminum	NA	NA	NA	NA	**1,660**	**1,090**	**5,130**	**1,310**	**5,590**	**3,760**	**6,060**	**3,900**	**7,510**	**6,600**	**4,620**
	Antimony	NA	NA	NA	NA	2.3 U	2.4 U	3.8 U	2.2 U	3.9 U	2.1 U	2.2 U	2.9 U	**2.4**	2.9 U	3.1
	Arsenic	NA	NA	NA	NA	2.3 U	2.4 U	3.8 U	2.2 U	3.9 U	2.1 U	**3.2**	**3.2**	**3.5**	**4.8**	3.1
	Barium	NA	NA	NA	NA	23 U	24 U	**77.3**	22 U	**157**	21 U	22 U	**51.1**	**93.9**	**67.1**	31
	Beryllium	NA	NA	NA	NA	0.23 U	0.24 U	**0.57**	0.22 U	**0.75**	**0.25**	**0.39**	0.29 U	**3.7**	0.29 U	0.31
	Cadmium	NA	NA	NA	NA	0.58 U	0.59 U	0.95 U	0.55 U	0.96 U	0.53 U	0.54 U	0.73 U	**0.59**	0.72 U	0.78
	Calcium	NA	NA	NA	NA	580 U	590 U	**1,100**	550 U	**1,400**	530 U	540 U	**1,370**	**706**	**947**	780
	Chromium (total)	**84.9**	**7,830**	**657**	**700**	**6.0**	**4.9**	**171**	**1.9**	**43.9**	**12.5**	**18.7**	**213**	**122**	**107**	**36.0**
	Chromium (VI)	NA	NA	NA	NA	**0.80**	0.46 U	0.74 U	0.44 U	0.78 U	0.43 U	**1.1**	**1.3**	**1.5**	**0.71**	**1.1**
	Cobalt	NA	NA	NA	NA	5.8 U	5.9 U	9.5 U	5.5 U	9.6 U	5.3 U	5.4 U	7.3 U	**6.4**	7.2 U	7.8
	Copper	**15.1**	**85.1**	NA	**45.1**	2.9 U	3.0 U	**5.5**	2.7 U	**6.7**	**2.7**	**3.9**	**7.7**	**20.4**	**12.4**	**7.5**
	Iron	NA	NA	NA	NA	**1,800**	**1,480**	**3,330**	**1,410**	**7,950**	**4,710**	**15,800**	**2,870**	**16,200**	**6,330**	**3,710**
	Lead	NA	NA	NA	NA	**9.8**	**8.5**	**22.5**	**8.8**	**22.0**	**13.3**	**10.8**	**19.0**	**81.1**	**58.4**	**29.4**
	Magnesium	NA	NA	NA	NA	580 U	590 U	950 U	550 U	960 U	530 U	540 U	730 U	**841**	720 U	780
	Manganese	NA	NA	NA	NA	**25.2**	**16.3**	**17.2**	**7.0**	**136**	**99.8**	**65.0**	**177**	**3,250**	**63.6**	**130**
	Mercury	NA	NA	NA	NA	0.037 U	0.035 U	**0.075**	0.037 U	**0.095**	0.033 U	0.031 U	**0.11**	**0.068**	**0.43**	**0.060**
	Nickel	**43.8**	**1,100**	NA	**121**	4.6 U	4.7 U	7.6 U	4.4 U	**16.1**	**5.8**	**4.5**	**15.8**	**300**	**10.8**	**29.3**

R2-0001628

Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**SD-106C**	**SD-107A**		**SD-107B**	**SD-01N**	**SD-01S**	**SD-04N**	**SD-04N-X**	**SD-04S**	**SD-10N**	**SD-10S**	**SD-13N**	**SD-13N-X**	**SD-13S**	**SD-15N**
	Sample ID:	SD-106C	SD-107A	BERA-SS-04	SD-107B	SD-01N	SD-01S	SD-04N	SD-04N-X	SD-04S	SD-10N	SD-10S	SD-13N	SD-13N-X	SD-13S	SD-15N
	Sample Depth (ft.):	0-0.5	0-0.5	0-1	0-0.5	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BG
	Sample Date:	4/11/1996	4/11/1996	10/20/2011	4/11/1996	10/13/2011	10/13/2011	10/6/2011	1/31/2012	10/6/2011	10/12/2011	10/12/2011	10/11/2011	1/30/2012	10/11/2011	10/7/20
	Potassium	NA	NA	NA	NA	1,200 U	1,200 U	1,900 U	1,100 U	1,900 U	1,100 U	1,100 U	1,500 U	1,200 U	1,400 U	1,600
	Selenium	NA	NA	NA	NA	2.3 U	2.4 U	3.8 U	2.2 U	3.9 U	2.1 U	2.2 U	2.9 U	2.4 U	2.9 U	3.1
	Silver	NA	NA	NA	NA	0.58 U	0.59 U	0.95 U	0.55 U	0.96 U	0.53 U	0.54 U	0.73 U	**92.5**	0.72 U	0.78
	Sodium	NA	NA	NA	NA	1,200 U	1,200 U	1,900 U	1,100 U	1,900 U	1,100 U	1,100 U	1,500 U	1,200 U	1,400 U	1,600
	Thallium	NA	NA	NA	NA	1.2 U	1.2 U	1.9 U	1.1 U	1.9 U	1.1 U	1.1 U	1.5 U	5.9 U	1.4 U	1.6
	Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Vanadium	**645**	**2,370**	**71.8**	**1,320**	**18.9**	**18.1**	**64.2**	5.5 U	**136**	**31.3**	**30.6**	**63.9**	**612**	**93.6**	**131**
	Zinc	NA	NA	NA	NA	**8.0**	**4.4**	**10.9**	**3.5**	**28.0**	**15.8**	**11.8**	**29.4**	**146**	**45.3**	**23.1**
General Chemistry																
(mg/kg)	Total Organic Carbon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**42,200**	NA	NA	NA
(s.u.)	pH	NA	NA	NA	NA	**5.20**	**5.22**	**6.08**	**4.47**	**6.27**	**5.35**	**5.64**	**6.08**	**7.50**	**6.12**	**6.45**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

B - Compound detected in associated method blank

D - Detected below the quantitation limit and above the method detection limit

J - Estimated value; detected below quantitation limit.

N - Indicates presumptive evidence of a compound.

NA - Sample not analyzed for the listed analyte.

ND - Not detected with unknown quantitation limit.

R - Rejected during data review.

NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260.
Aroclor 1254 is the predominant PCB; however, the reported value is
based on peaks common to both Aroclors.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in **Bold** indicate the compound was detected.

VOCs - Volatile Organic Compounds.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

^ - Data not QC'd by TRC.

R2-0001629

Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	N	**SD-15S**		**SD-18N**	**SD-18N-X**		**SD-18S**	**SD-18S-X**	**SD-23N**	**SD-23N-X**	**SD-23S**	**SD-23S-X**
	Sample ID:	N	SD-15S	SD-39S	SD-18N	SD-18N-X	SD-45N-X	SD-18S	SD-18S-X	SD-23N	SD-23N-X	SD-23S	SD-23S-X
	Sample Depth (ft.):	S	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS
	Sample Date:	11	10/7/2011	10/7/2011	10/7/2011	1/31/2012	1/31/2012	10/7/2011	1/30/2012	10/6/2011	1/31/2012	10/6/2011	1/31/2012
SVOCs													
(mg/kg)	Acenaphthylene	U	**0.0158 J**	**0.0227 J**	**0.0244 J**	**0.0148 J**	**0.0208 J**	**0.0844 J**	0.033 U	**0.0328 J**	0.033 U	0.11 U	0.035 U
	Anthracene	U	0.039 U	0.0400 U	0.060 UJ	**0.0128 J**	**0.0172 J**	**0.101 J**	0.033 U	**0.0318 J**	0.033 U	0.11 U	0.035 U
	Benzo(a)anthracene	**J**	**0.0297 J**	**0.0403**	**0.0733 J**	**0.0205 J**	**0.0253 J**	**0.563 J**	**0.013 J**	**0.104**	R	0.11 U	R
	Benzo(a)pyrene	U	**0.0279 J**	**0.0463**	**0.118 J**	0.033 U	0.033 U	**0.866 J**	0.033 U	**0.123**	0.033 U	0.11 U	0.035 U
	Benzo(b)fluoranthene	U	**0.0245 J**	**0.0359 J**	**0.134 J**	0.033 U	0.033 U	**0.859 J**	0.033 U	**0.18**	0.033 U	**0.0503 J**	0.035 U
	Benzo(ghi)perylene	U	**0.0223 J**	**0.0345 J**	**0.107 J**	0.033 U	0.033 U	**0.697 J**	0.033 U	**0.0951**	0.033 U	0.11 U	0.035 U
	Benzo(k)fluoranthene	U	**0.0294 J**	**0.0395 J**	**0.126 J**	0.033 U	0.033 U	**0.956 J**	0.033 U	**0.0666 J**	0.033 U	0.11 U	0.035 U
	Benzaldehyde	U	0.19 U	0.200 U	0.30 UJ	0.17 U	0.16 U	0.47 UJ	0.16 U	0.38 U	0.16 U	0.53 U	0.17 U
	Carbazole	U	0.077 U	0.0800 U	0.12 UJ	0.066 U	0.065 U	**0.0577 J**	0.065 U	0.15 U	0.066 U	0.21 U	0.07 U
	Chrysene	**J**	**0.0407**	**0.0612**	**0.133 J**	**0.0333**	**0.0438**	**1.02 J**	**0.0154 J**	**0.124**	R	0.11 U	R
	Dibenz(a,h)anthracene	U	0.039 U	0.0400 U	0.060 UJ	0.033 U	0.033 U	**0.159 J**	0.033 U	0.076 U	0.033 U	0.11 U	0.035 U
	Dimethyl phthalate		**0.0749 J**	**0.0809**	**0.197 J**	**0.0861**	**0.0284 J**	**0.202 J**	**0.0642 JB**	**0.126 J**	**0.0574 J**	0.21 U	**0.0531 J**
	bis(2-Ethylhexyl)phthalate	U	0.077 U	0.0800 U	0.12 UJ	**0.0626 J**	**0.0547 J**	**0.231 J**	0.065 U	0.15 U	R	0.21 U	**0.0554 J**
	Fluoranthene	**J**	**0.0601**	**0.0842**	**0.203 J**	**0.0263 J**	**0.0337**	**1.67 J**	**0.0263 J**	**0.152**	0.033 U	**0.056 J**	0.035 U
	Indeno(1,2,3-cd)pyrene	U	**0.0179 J**	**0.0283 J**	**0.0866 J**	0.033 U	0.033 U	**0.598 J**	0.033 U	**0.078**	0.033 U	0.11 U	0.035 U
	Phenanthrene	**J**	**0.0385 J**	**0.0515**	**0.0672 J**	**0.0389**	**0.0433**	**0.494 J**	**0.0179 J**	**0.0767**	0.033 U	0.11 U	0.035 U
	Pyrene	**J**	**0.0692**	**0.0972**	**0.199 J**	**0.104**	**0.123**	**1.54 J**	**0.0274 J**	**0.168**	R	**0.0615 J**	R
PCBs													
(mg/kg)	Aroclor-1248	U	0.040 U	0.041 U	0.061 UJ	0.034 U	0.033 U	**0.308 J**	0.034 U	0.079 U	0.034 U	0.11 U	0.035 U
	Aroclor-1254	**J**	0.040 U	0.041 U	0.061 UJ	0.034 U	0.033 U	**0.261 J**	0.034 U	0.079 U	0.034 U	0.11 U	0.035 U
	Aroclor-1260	**J**	0.040 U	0.041 U	0.061 UJ	0.034 U	0.033 U	**0.240 J**	0.034 U	0.079 U	0.034 U	0.11 U	0.035 U
	Total PCBs	**J**	0.040 U	0.041 U	0.061 UJ	0.034 U	0.033 U	**0.809 J**	0.034 U	0.079 U	0.034 U	0.11 U	0.035 U
Pesticides													
(mg/kg)	Aldrin	U	0.0008 U	0.00083 U	0.0012 UJ	0.00068 U	0.00066 U	0.0019 UJ	0.00067 U	0.0016 U	0.00068 U	**0.0055**	0.00071 U
	Dieldrin	U	0.0008 U	0.00083 U	0.0012 UJ	0.00068 U	0.00066 U	0.0019 UJ	0.00067 U	**0.0042**	0.00068 U	0.0022 U	0.00071 U
	4,4'-DDD	U	0.0008 U	0.00083 U	**0.008 J**	**0.0082**	**0.0056**	0.0019 UJ	0.00067 U	**0.0134**	0.00068 U	**0.0452**	0.00071 U
	4,4'-DDE	U	0.0008 U	0.00083 U	**0.0142 J**	**0.0478**	**0.0282**	0.0019 UJ	**0.0028**	**0.023**	0.00068 U	**0.0338**	**0.001**
	4,4'-DDT	U	0.0008 U	0.00083 U	**0.009 J**	**0.0316**	0.00066 U	0.0019 UJ	**0.0034**	**0.0263**	0.00068 U	**0.0621**	**0.0018**
	Endosulfan sulfate	U	0.0008 U	0.00083 U	0.0012 UJ	0.00068 U	**0.0012**	0.0019 UJ	0.00067 U	0.0016 U	0.00068 U	**0.0084**	0.00071 U
Metals, total													
(mg/kg)	Aluminum		**12,800**	**13,900**	**11,800 J**	**4,810**	**4,740**	**20,000 J**	**2,350**	**10,600**	**119**	**22,900**	**411**
	Antimony	U	2.8 U	2.7 U	**4.4 J**	2.3 U	2.3 U	**19.4 J**	2.2 U	5.3 U	2.2 U	7.6 U	2.5 U
	Arsenic	U	**6.9**	**7.1**	**5.9 J**	**2.3**	2.3 U	**20.5 J**	2.2 U	**9.3**	2.2 U	**11.6**	2.5 U
	Barium	U	**43.5**	**50.9**	**97.9 J**	23 U	23 U	**285 J**	22 U	**221**	22 U	**307**	25 U
	Beryllium	U	**0.50**	**0.54**	**0.49 J**	0.23 U	0.23 U	0.62 UJ	0.22 U	0.53 U	0.22 U	0.76 U	0.25 U
	Cadmium	U	0.69 U	0.67 U	1.0 UJ	0.57 U	0.57 U	**1.8 J**	0.55 U	1.3 U	0.56 U	1.9 U	0.63 U
	Calcium	U	690 U	670 U	**1,700 J**	**872**	**866**	**3,760 J**	550 U	**2,760**	560 U	**7,610**	630 U
	Chromium (total)		**17.0**	**18.0**	**643 J**	**6.9**	**6.8**	**2,730 J**	**5.7**	**1,050**	1.1 U	**1,420**	**1.3**
	Chromium (VI)		**0.86 J**	**2.5 J**	**1.8 J**	0.46 U	0.46 U	1.3 UJ	0.46 U	**1.8**	0.46 U	**2.7**	0.49 U
	Cobalt	U	6.9 U	6.7 U	10 UJ	5.7 U	5.7 U	**22.7 J**	5.5 U	13 U	5.6 U	19 U	6.3 U
	Copper		**11.9**	**12.5**	**57.1 J**	**7.0**	**6.8**	**188 J**	2.7 U	**35.5**	2.8 U	**43.2**	3.2 U
	Iron		**16,900**	**17,900**	**11,600 J**	**4,670**	**4,100**	**29,000 J**	**3,140**	**9,670**	**206**	**17,900**	**615**
	Lead		**30.3**	**31.9**	**89.5 J**	**16.5**	**16.7**	**210 J**	**41.2**	**61.5**	2.2 U	**95.0**	**8.6**
	Magnesium	U	690 U	**716**	1,000 UJ	570 U	570 U	1,600 UJ	550 U	1,300 U	560 U	**2,090**	630 U
	Manganese		**40.0**	**38.9**	**84.9 J**	**58.8**	**49.7**	**710 J**	**13.0**	**297**	**7.8**	**672**	**6.4**
	Mercury		**0.46**	**0.44**	**0.28 J**	0.038 U	0.036 U	**0.93 J**	**0.056**	**0.44**	0.036 U	**0.28**	0.039 U
	Nickel		**6.4**	**6.6**	**106 J**	4.6 U	4.6 U	**493 J**	4.4 U	**55.8**	4.5 U	**47.4**	5.0 U

R2-0001630

Table A-6
Summary of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	N	**SD-15S**		**SD-18N**	**SD-18N-X**		**SD-18S**	**SD-18S-X**	**SD-23N**	**SD-23N-X**	**SD-23S**	**SD-23S-X**
	Sample ID:	N	SD-15S	SD-39S	SD-18N	SD-18N-X	SD-45N-X	SD-18S	SD-18S-X	SD-23N	SD-23N-X	SD-23S	SD-23S-X
	Sample Depth (ft.):	S	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS	0-1 BGS
	Sample Date:	11	10/7/2011	10/7/2011	10/7/2011	1/31/2012	1/31/2012	10/7/2011	1/30/2012	10/6/2011	1/31/2012	10/6/2011	1/31/2012
	Potassium	U	1,400 U	1,300 U	2,100 UJ	1,100 U	1,100 U	3,100 UJ	1,100 U	2,600 U	1,100 U	3,800 U	1,300 U
	Selenium	U	2.8 U	2.7 U	4.1 UJ	2.3 U	2.3 U	6.2 UJ	2.2 U	5.3 U	2.2 U	7.6 U	2.5 U
	Silver	U	0.69 U	0.67 U	1.0 UJ	0.57 U	0.57 U	1.6 UJ	0.55 U	1.3 U	0.56 U	1.9 U	0.63 U
	Sodium	U	1,400 U	1,300 U	2,100 UJ	1,100 U	1,100 U	3,100 UJ	1,100 U	2,600 U	1,100 U	3,800 U	1,300 U
	Thallium	U	1.4 U	1.3 U	2.1 UJ	1.1 U	1.1 U	3.1 UJ	1.1 U	2.6 U	1.1 U	3.8 U	1.3 U
	Titanium		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Vanadium		**24.2**	**25.6**	**430 J**	**10.8**	**10.6**	**1,610 J**	**8.8**	**415**	5.6 U	**332**	6.3 U
	Zinc		**31.4**	**31.2**	**117 J**	**26.4**	**25.5**	**366 J**	**8.1**	**87.6**	2.2 U	**172**	2.5 U
General Chemistry													
(mg/kg)	Total Organic Carbon		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
(s.u.)	pH		**6.58**	**6.58**	**6.16**	**6.77**	**6.84**	**6.69**	**4.97**	**6.15**	**4.22**	**5.99**	**3.86**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
D - Detected below the quantitation limit and above the method detection limit
J - Estimated value; detected below quantitation limit.
N - Indicates presumptive evidence of a compound.
NA - Sample not analyzed for the listed analyte.
ND - Not detected with unknown quantitation limit.
R - Rejected during data review.
NR - Not Reported due to the presence of a mixture of Aroclors 1254 and 1260.
Aroclor 1254 is the predominant PCB; however, the reported value is
based on peaks common to both Aroclors.
U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.
Values in **Bold** indicate the compound was detected.
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.
PCBs - Polychlorinated Biphenyls.
^ - Data not QC'd by TRC.

Table A-7
Statistics of Analytical Results for Reference Area Soil Samples
SMC Facility
Newfield, New Jersey

Analysis	Sample Location:	**BERA-SS-15**	**BERA-SS-16**	**BG-1**	**BG-2**	**BG-3**	**BG-4**	**BG-5**	**BG-6**	**BG-7**	**BG-8**	**BG-9**	**BG-10**	**BG-11**	**BG-12**	**BG-13**
	Sample ID:	BERA-SS-15	BERA-SS-16	BG-1	BG-2	BG-3	BG-4	BG-5	BG-6	BG-7	BG-8	BG-9	BG-10	BG-11	BG-12	BG-13
	Sample Depth (ft.):	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
	Sample Date:	10/20/2011	10/20/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011
Metals, total																
(mg/kg)	Aluminum	NA	NA	**8,560**	**8,940**	**6,400**	**4,890**	**15,900**	**3,480**	**2,920**	**8,590**	**7,300**	**5,770**	**4,990**	**8,300**	**10,200**
	Arsenic	NA	NA	**2.9**	**2.6**	**2.4**	2.4 U	**6.8**	**4.0**	2.2 U	**3.3**	2.0 U	2.1 U	**2.4**	**3.5**	**4.0**
	Barium	NA	NA	22 U	22 U	22 U	24 U	**47.8**	23 U	22 U	24 U	20 U	21 U	22 U	**25.9**	**25.2**
	Beryllium	NA	NA	0.22 U	0.22 U	0.22 U	0.24 U	**0.33**	0.23 U	0.22 U	**0.25**	0.20 U	0.21 U	0.22 U	0.24 U	**0.30**
	Calcium	NA	NA	540 U	540 U	540 U	610 U	**823**	570 U	560 U	590 U	500 U	530 U	550 U	600 U	600 U
	Chromium (total)	**11.8**	**1.9**	**11.3**	**12.8**	**7.7**	**7.4**	**18.3**	**4.7**	**3.0**	**13.3**	**8.5**	**8.6**	**8.9**	**10.2**	**12.7**
	Chromium (VI)	NA	NA	**1.1**	0.45 U	**0.53**	**0.54**	**0.63**	0.44 U	0.43 U	0.46 U	0.59 U	**0.88**	0.44 U	0.47 U	0.47 U
	Cobalt	NA	NA	5.4 U	5.4 U	5.4 U	6.1 U	**6.2**	5.7 U	5.6 U	5.9 U	5.0 U	5.3 U	5.5 U	6.0 U	6.0 U
	Copper	NA	NA	2.7 U	**3.0**	2.7 U	3.0 U	**9.8**	**8.1**	2.8 U	**3.4**	2.5 U	2.6 U	2.7 U	**4.7**	3.0 U
	Iron	NA	NA	**12,000**	**9,570**	**7,030**	**5,360**	**15,800**	**3,230**	**2,510**	**13,100**	**6,750**	**7,720**	**6,780**	**10,100**	**14,900**
	Lead	NA	NA	**9.7**	**9.8**	**9.1**	**5.5**	**35.3**	**12.7**	**6.6**	**13.5**	**12.5**	**5.4**	**8.5**	**17.2**	**12.5**
	Magnesium	NA	NA	540 U	540 U	540 U	610 U	**887**	570 U	560 U	590 U	500 U	530 U	550 U	600 U	600 U
	Manganese	NA	NA	**35.5**	**30.9**	**24.4**	**32.6**	**107**	**17.2**	**11.4**	**35.0**	**23.1**	**20.2**	**50.0**	**46.4**	**43.7**
	Mercury	NA	NA	0.035 U	0.035 U	0.034 U	0.039 U	**0.13**	**0.14**	0.034 U	**0.044**	0.047 U	0.032 U	**0.17**	0.039 U	0.039 U
	Nickel	NA	NA	**4.8**	**4.5**	4.3 U	4.9 U	**8.4**	4.5 U	4.4 U	4.7 U	4.0 U	4.2 U	4.4 U	4.8 U	**4.9**
	Vanadium	**15.5**	5.1 U	**15.1**	**17.5**	**11.4**	**9.0**	**28.0**	**6.8**	5.6 U	**18.0**	**15.7**	**11.2**	**13.6**	**17.8**	**19.2**
	Zinc	NA	NA	**12.6**	**11.5**	**8.8**	**8.8**	**50.6**	**15.8**	**5.6**	**15.7**	**9.8**	**8.5**	**18.5**	**19.1**	**18.7**
General Chemistry																
(s.u.)	pH	NA	NA	**4.81**	**4.63**	**4.49**	**4.41**	**6.12**	**4.84**	**4.39**	**4.57**	**4.13**	**4.38**	**5.05**	**4.81**	**4.60**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
s.u. - Standard unit.
J - Estimated value.
NA - Sample not analyzed for the listed analyte.
U - Compound was not detected at specified quantitation limit.
Values in **Bold** indicate the compound was detected.

Table A-8
Summary of Analytical Results for Hudson Branch Aquatic Vegetation Samples -- October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample ID: / Sample Date: / Analyte	BERA-AV-01 10/20/2011	BERA-AV-02 10/20/2011	BERA-AV-03 10/20/2011	BERA-AV-04 10/20/2011	BERA-AV-05 10/19/2011	BERA-AV-06 10/19/2011	BERA-AV-07 10/19/2011	BERA-AV-08 10/19/2011
Metal, total									
(mg/kg)	Chromium	**18.9 J**	**268 J**	**161 J**	**136 J**	**560**	**61.4**	**194**	**737**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

J - Estimated value.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

Table A-9
Summary of Analytical Results for Reference Area Aquatic Vegetation Samples -- October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample ID: Sample Date: Analyte	BERA-AV-09 10/20/2011	BERA-AV-10 10/20/2011
Metal, total			
(mg/kg)	Chromium	**12**	**6.12**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

J - Estimated value.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

Table A-10
Summary of Analytical Results for Hudson Branch Aquatic Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Sample ID:	BERA-AI-01		BERA-AI-02		BERA-AI-03		BERA-AI-04		BERA-AI-05		BERA-AI-06		BERA-AI-07		BERA-AI-08	
	Sample Date:	10/20/2011		10/20/2011 *		10/20/2011 *		10/20/2011		10/19/2011		10/19/2011		10/19/2011		10/19/2011	
	Analyte																
Metals, total																	
(mg/kg)	Antimony	0.786	UJ	0.050	UJ	0.067	UJ	0.556	UJ	0.884	U	0.833	U	1.01	U	0.724	U
	Barium	**16.6**	**J**	**45.8**	**J**	**19.23**	**J**	**26.4**	**J**	**120**		**19.8**		**112**		**71.6**	
	Chromium	**140**	**J**	**157**	**J**	**26.31**	**J**	**67.1**	**J**	**262**		**81.6**		**291**		**519**	
	Copper	**48.2**	**J**	**150**	**J**	**66.77**	**J**	**56.4**	**J**	**54.7**		**33.2**		**74.8**		**51**	
	Mercury	0.196	UJ	**0.554**	**J**	**0.569**	**J**	**0.173**	**J**	**0.469**		**0.376**		**0.416**		0.181	U
	Vanadium	68.2	J	**198**	**J**	**19.54**	**J**	**83.4**	**J**	**656**		**24.2**		**131**		**93.5**	
Other																	
	% Solids	6%		-		-		9%		6%		6%		5%		7%	

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

J - Estimated value.

U - Compound was not detected at specified quantitation limit.

UJ - Estimated non-detect.

Values in **Bold** indicate the compound was detected.

* - Reported on a wet weight basis. Converted to dry weight by dividing by mean % solids (6.5%).

Table A-11
Summary of Analytical Results for Reference Area Aquatic Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample ID: / Sample Date: / Analyte	BERA-AI-09 10/20/2011 *	BERA-AI-10 10/20/2011
Metals, total			
(mg/kg)	Barium	**34.13**	**10.8**
	Chromium	**8.00**	**5.49**
	Copper	**15.06**	**26.9**
	Mercury	**0.919**	**1.26**
	Vanadium	**3.63**	3.24 U
Other			
	% Solids	-	**16%**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

* - Reported on a wet weight basis. Converted to dry weight by dividing by mean % solids (16%).

Table A-12
Summary of Analytical Results for Eastern Storage Area Terrestrial Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample ID: / Sample Date: / Analyte	BERA-TI-09	BERA-TI-10	BERA-TI-11	BERA-TI-12	BERA-TI-13	BERA-TI-14
	Sample Date:	10/25/2011	10/25/2011	10/25/2011	10/25/2011	10/25/2011	10/25/2011
Metals, total							
(mg/kg)	Chromium	**38.9**	**63.3**	**116**	**34.7**	**5.42**	**5.23**
	Vanadium	**29.8**	**43.6**	**189**	**31.2**	3.77 U	**8.96**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

Table A-13
Summary of Analytical Results for Hudson Branch Wetland Terrestrial Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample ID:	BERA-TI-01		BERA-TI-02		BERA-TI-03		BERA-TI-04		BERA-TI-05		BERA-TI-07		BERA-TI-08	
	Sample Date:	10/25/2011		10/25/2011		10/25/2011		10/26/2011		10/25/2011		10/25/2011		10/25/2011	
	Analyte														
Metals, total															
(mg/kg)	Chromium	**40.8**	**J**	**829**	**J**	**37.8**	**J**	**30.2**	**J**	**7.13**		**130**		**124**	
	Vanadium	**42.3**	**J**	**168**	**J**	**61.3**	**J**	**35.9**	**J**	6.32	U	**90.6**		**84.8**	

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

J - Estimated value.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

Table A-14
Summary of Analytical Results for Reference Area Terrestrial Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

Analysis	Sample ID: / Sample Date: / Analyte	BERA-TI-15 10/25/2011	BERA-TI-16 10/25/2011
Metals, total			
(mg/kg)	Chromium	**14.0**	**16.8**
	Vanadium	**9.77**	**9.45**

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

Values in **Bold** indicate the compound was detected.

APPENDIX B
SUMMARY STATISTICS

Table B-1
Statistics of Analytical Results for Hudson Branch Surface Water Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (ug/L)	Max. of Detects (ug/L)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (ug/L)	UCL Mean (ug/L)	UCL Rationale
VOCs												
	cis-1,2-Dichloroethene	7	1	14.3%	0.57	0.57	SW-01	1	1	9.4E-01	5.7E-01	Max. of Detects
Metals, total												
	Aluminum	13	13	100.0%	74	239	SW-01	--	--	1.16E+02	1.42E+02	95% Student's-t UCL
	Calcium	13	12	92.3%	5300	10000	SW-27	5000	5000	7.96E+03	8.77E+03	95% KM (t) UCL
	Chromium (total)	13	9	69.2%	15	42	SW-13	10	10	1.92E+01	4.20E+01	Max. of Detects
	Cobalt	13	13	100.0%	0.3	7.7	SW-13	--	--	1.72E+00	2.98E+00	95% Approximate Gamma UCL
	Copper	13	12	92.3%	1	8	SW-13	1	1	3.92E+00	8.00E+00	Max. of Detects
	Iron	13	13	100.0%	297	3,460	SW-10	--	--	1.06E+03	2.31E+03	95% Chebyshev (Mean, Sd) UCL
	Lead	13	2	15.4%	3.5	3.8	SW-01	3	3	3.10E+00	3.80E+00	Max. of Detects
	Magnesium	13	4	30.8%	5110	10080	SW-01	5000	5000	5.66E+03	1.01E+04	Max. of Detects
	Manganese	13	13	100.0%	17.1	1160	SW-13	--	--	2.10E+02	5.86E+02	95% Chebyshev (Mean, Sd) UCL
	Nickel	13	2	15.4%	11.15	24.6	SW-13	10	10	1.12E+01	2.46E+01	Max. of Detects
	Potassium	13	1	7.7%	10650	10650	SW-01	10000	10000	1.01E+04	1.07E+04	Max. of Detects
	Sodium	13	11	84.6%	14800	94350	SW-15	10000	10000	5.12E+04	6.81E+04	95% KM (t) UCL
	Vanadium	13	8	61.5%	39	80	SW-15	5	50	3.86E+01	8.00E+01	Max. of Detects
	Zinc	13	1	7.7%	20.45	20.45	SW-15	20	20	2.00E+01	2.05E+01	Max. of Detects
Metals, dissolved												
	Aluminum	13	8	61.5%	52	282.5	SW-01	50	50	7.54E+01	2.83E+02	Max. of Detects
	Calcium	13	12	92.3%	5240	9970	SW-27	5000	5000	7.93E+03	8.72E+03	95% KM (t) UCL
	Chromium (total)	13	8	61.5%	10.1	49.5	SW-01	10	10	1.67E+01	4.95E+01	Max. of Detects
	Cobalt	13	13	100.0%	0.2	7.1	SW-13	--	--	1.94E+00	3.37E+00	95% Approximate Gamma UCL
	Copper	13	11	84.6%	1	6.5	SW-01	1	1	3.04E+00	3.89E+00	95% KM (t) UCL
	Iron	13	13	100.0%	246	2770	SW-01	--	--	6.63E+02	1.62E+03	95% Chebyshev (Mean, Sd) UCL
	Magnesium	13	5	38.5%	5005	6890	SW-10	5000	5000	5.34E+03	6.89E+03	Max. of Detects
	Manganese	13	13	100.0%	19.7	1160	SW-13	--	--	1.94E+02	3.46E+02	95% Approximate Gamma UCL
	Nickel	13	2	15.4%	10.45	24.2	SW-13	10	10	1.11E+01	2.42E+01	Max. of Detects
	Sodium	13	11	84.6%	15200	96600	SW-15	10000	10000	5.33E+04	7.05E+04	95% KM (t) UCL
	Vanadium	13	8	61.5%	19	70.5	SW-15	5	50	3.17E+01	7.05E+01	Max. of Detects
Hardness												
	Hardness, total	13	13	100.0%	31400	60500	SW-27	--	--	4.72E+04	5.15E+04	95% Student's-t UCL

Notes:
ug/L - micrograms per liter.
UCL - Upper confidence level.

Table B-2
Statistics of Analytical Results for Reference Area Surface Water Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (ug/L)	Max. of Detects (ug/L)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (ug/L)	UCL Mean (ug/L)	UCL Rationale
VOCs												
	Methyl Tert Butyl Ether	8	3	37.5%	0.24	2.3	SW-37	1	1	1.1E+00	2.3E+00	Max. of Detects
Metals, total												
	Aluminum	8	8	100.0%	92	612	SW-37	--	--	2.20E+02	6.12E+02	Max. of Detects
	Barium	7	2	28.6%	238	248	SW-36	200	200	2.12E+02	2.48E+02	Max. of Detects
	Calcium	7	7	100.0%	7710	11100	SW-33	--	--	9.65E+03	1.11E+04	Max. of Detects
	Cobalt	8	8	100.0%	4.8	23.6	SW-37	--	--	8.65E+00	2.36E+01	Max. of Detects
	Copper	8	5	62.5%	1	1	SW-32	1	1	1.00E+00	1.00E+00	Max. of Detects
	Iron	7	7	100.0%	195	1,320	SW-37	--	--	4.39E+02	1.32E+03	Max. of Detects
	Lead	8	1	12.5%	4.3	4.3	SW-37	3	3	3.16E+00	4.30E+00	Max. of Detects
	Manganese	7	7	100.0%	131	447	SW-37	--	--	1.99E+02	4.47E+02	Max. of Detects
	Mercury	8	1	12.5%	0.38	0.38	SW-37	0.2	0.2	2.23E-01	3.80E-01	Max. of Detects
	Sodium	7	2	28.6%	12800	13400	SW-37	10000	10000	1.09E+04	1.34E+04	Max. of Detects
Metals, dissolved												
	Aluminum	8	7	87.5%	50	162	SW-37	50	50	8.20E+01	1.62E+02	Max. of Detects
	Barium	7	2	28.6%	249	275	SW-37	200	200	2.18E+02	2.75E+02	Max. of Detects
	Calcium	7	7	100.0%	7770	10800	SW-33	--	--	9.83E+03	1.08E+04	Max. of Detects
	Cobalt	8	8	100.0%	4.4	22.3	SW-37	--	--	7.80E+00	2.23E+01	Max. of Detects
	Copper	8	1	12.5%	1	1	SW-37	1	1	1.00E+00	1.00E+00	Max. of Detects
	Iron	7	6	85.7%	102	129	SW-36	100	100	1.11E+02	1.29E+02	Max. of Detects
	Manganese	7	7	100.0%	127	527	SW-37	--	--	2.07E+02	5.27E+02	Max. of Detects
	Sodium	7	2	28.6%	12900	15500	SW-37	10000	10000	1.12E+04	1.55E+04	Max. of Detects
Hardness												
	Hardness, total	8	8	100.0%	39200	51000	SW-35	--	--	4.46E+04	5.10E+04	Max. of Detects

Notes:

ug/L - micrograms per liter.

UCL - Upper confidence level.

Table B-3
Statistics of Analytical Results for Hudson Branch Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
SVOCs												
(mg/kg)	Acenaphthene	17	1	5.9%	0.0198	0.0198	SD-10	0.033	0.29	7.5E-02	0.0198	Max. of Detects
	Acenaphthylene	17	7	41.2%	0.03835	0.357	SD-13-2	0.033	0.29	9.6E-02	0.357	Max. of Detects
	Anthracene	17	7	41.2%	0.0373	0.262	SD-13-2	0.033	0.29	9.0E-02	0.262	Max. of Detects
	Benzo(a)anthracene	17	11	64.7%	0.0177	0.604	SD-10-2	0.033	0.069	1.4E-01	0.201	95% KM (t) UCL
	Benzo(a)pyrene	17	9	52.9%	0.0574	0.674	SD-10-2	0.033	0.29	1.7E-01	0.674	Max. of Detects
	Benzo(b)fluoranthene	17	9	52.9%	0.0724	0.963	SD-10-2	0.033	0.29	2.1E-01	0.963	Max. of Detects
	Benzo(g,h,i)perylene	17	9	52.9%	0.0475	0.51	SD-10-2	0.033	0.29	1.5E-01	0.51	Max. of Detects
	Benzo(k)fluoranthene	17	9	52.9%	0.0367	0.346	SD-10-2	0.033	0.29	1.1E-01	0.346	Max. of Detects
	Carbazole	17	3	17.6%	0.04495	0.0815	SD-10-2	0.067	0.58	1.3E-01	0.0815	Max. of Detects
	Chrysene	17	11	64.7%	0.0192	0.826	SD-10-2	0.033	0.069	1.9E-01	0.275	95% KM (t) UCL
	Dibenzo(a,h)anthracene	17	6	35.3%	0.0176	0.123	SD-10-2	0.033	0.29	7.2E-02	0.123	Max. of Detects
	Di-n-octyl phthalate	17	1	5.9%	0.197	0.197	SD-IMP1A	0.067	0.58	1.6E-01	0.197	Max. of Detects
	Dimethyl phthalate	17	13	76.5%	0.038	0.408	SD-13	0.085	0.58	1.6E-01	0.168	95% KM (BCA) UCL
	bis(2-ethylhexyl)phthalate	17	13	76.5%	0.0351	1.25	SD-10-1	0.085	0.14	3.2E-01	0.746	95% KM (Chebyshev) UCL
	Fluoranthene	17	12	70.6%	0.0304	1.48	SD-10-2	0.033	0.036	2.9E-01	0.703	95% KM (Chebyshev) UCL
	Fluorene	17	3	17.6%	0.0355	0.0585	SD-10-2	0.033	0.29	6.8E-02	0.0585	Max. of Detects
	Indeno(1,2,3-cd)pyrene	17	9	52.9%	0.0408	0.438	SD-10-2	0.033	0.29	1.3E-01	0.438	Max. of Detects
	2-Methylnaphthalene	17	1	5.9%	0.0812	0.0812	SD-13-2	0.067	0.58	1.4E-01	0.0812	Max. of Detects
	Phenanthrene	17	9	52.9%	0.0495	0.698	SD-10-2	0.033	0.069	1.7E-01	0.698	Max. of Detects
	Pyrene	17	13	76.5%	0.015	1.27	SD-10-2	0.034	0.036	3.0E-01	0.459	95% KM (t) UCL
Pesticides												
(mg/kg)	alpha-Chlordane	17	3	17.6%	0.00455	0.00685	SD-13	0.00069	0.003	2.1E-03	0.00685	Max. of Detects
	gamma-Chlordane	17	1	5.9%	0.0058	0.0058	SD-13	0.00069	0.003	1.6E-03	0.0058	Max. of Detects
	Dieldrin	17	4	23.5%	0.0016	0.00505	SD-13	0.0007	0.003	1.7E-03	0.00505	Max. of Detects
	4,4'-DDD	17	10	58.8%	0.0017	0.0296	SD-13-2	0.0007	0.003	6.1E-03	0.00961	95% KM (t) UCL
	4,4'-DDE	17	11	64.7%	0.0017	0.01065	SD-10-1	0.0007	0.003	4.0E-03	0.00564	95% KM (t) UCL
	4,4'-DDT	17	7	41.2%	0.0017	0.0107	SD-13-2	0.00069	0.003	3.5E-03	0.0107	Max. of Detects
PCBs												
(mg/kg)	Aroclor 1248	17	3	17.6%	0.163	0.313	SD-15-1	0.034	0.13	9.2E-02	0.313	Max. of Detects
	Aroclor 1254	17	3	17.6%	0.11	0.1485	SD-10-1	0.034	0.15	7.9E-02	0.1485	Max. of Detects
	Aroclor 1260	17	4	23.5%	0.0393	0.256	SD-15-1	0.035	0.13	7.9E-02	0.256	Max. of Detects
	Total PCBs	17	6	35.3%	0.0393	0.569	SD-15-1	0.035	0.13	1.3E-01	0.569	Max. of Detects
Metals, total												
(mg/kg)	Aluminum	23	23	100.0%	296	37800	SD-13-2	--	--	1.2E+04	17332	95% Approximate Gamma UCL
	Antimony	29	9	31.0%	3.05	34.3	SD-13-2	1.6	8.5	8.9E+00	34.3	Max. of Detects
	Arsenic	33	24	72.7%	1.8	34.7	SD-15-1	2	7.7	8.3E+00	10.38	95% KM (Percentile Bootstrap) UCL
	Barium	29	26	89.7%	18.5	394	SD-13	23	24	1.3E+02	172.6	95% KM (BCA) UCL
	Beryllium	29	12	41.4%	0.25	10.65	SD-10-1	0.16	0.85	1.2E+00	2.159	95% KM (BCA) UCL
	Cadmium	33	6	18.2%	0.59	2.5	SD-15-1	0.41	2.6	1.0E+00	2.5	Max. of Detects
	Calcium	23	14	60.9%	663	3110	SD-10-2	410	760	1.4E+03	1742	95% KM (t) UCL
	Chromium	39	38	97.4%	13.4	10200	SD-15-1	3.8	3.8	1.9E+03	3610	97.5% KM (Chebyshev) UCL

Table B-3
Statistics of Analytical Results for Hudson Branch Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
	Cobalt	23	6	26.1%	8.7	33.3	SD-15-1	4.1	21	1.2E+01	33.3	Max. of Detects
	Copper	39	36	92.3%	3.2	247	SD-17	2.9	9.6	7.7E+01	164.6	97.5% KM (Chebyshev) UCL
	Iron	33	33	100.0%	1300	36000	SD-13-2	--	--	1.3E+04	17227	95% Approximate Gamma UCL
	Lead	39	38	97.4%	4.8	317.5	SD-10-1	2.3	2.3	8.4E+01	176.3	97.5% KM (Chebyshev) UCL
	Magnesium	23	7	30.4%	544	2360	SD-15-1	410	2100	1.2E+03	2360	Max. of Detects
	Manganese	33	33	100.0%	9.9	507	SD-15-1	--	--	2.0E+02	247.8	95% Approximate Gamma UCL
	Mercury	39	37	94.9%	0.049	2.5	SD-18	0.038	0.039	6.2E-01	1.115	95% KM (Chebyshev) UCL
	Nickel	39	36	92.3%	6.3	1140	SD-15-1	4.7	15	1.4E+02	351.1	97.5% KM (Chebyshev) UCL
	Potassium	23	2	8.7%	1130	1200	SD-13-2	820	4200	1.8E+03	1200	Max. of Detects
	Selenium	29	1	3.4%	2	2	SD-15-1	1.6	8.5	3.9E+00	2	Max. of Detects
	Silver	23	1	4.3%	0.615	0.615	SD-10-1	0.41	2.4	9.6E-01	0.615	Max. of Detects
	Vanadium	29	28	96.6%	5.9	3280	SD-15-1	19	19	4.9E+02	1061	95% KM (Chebyshev) UCL
	Zinc	39	39	100.0%	2.7	525	SD-15-1	--	--	1.3E+02	174.9	95% Approximate Gamma UCL
General Chemistry												
(mg/kg)	Total Organic Carbon	33	32	97.0%	1220	158000	SD-09	1200	1200	5.4E+04	101277	97.5% KM (Chebyshev) UCL
(s.u.)	pH	33	33	100.0%	4.65	7.48	SD-IMP1A	--	--	6.6E+00	6.813	95% Student's-t UCL

Notes:

mg/kg - milligrams per kilogram (or parts per million).

s.u. - Standard unit.

UCL - Upper confidence level.

Table B-4
Statistics of Analytical Results for Reference Area Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
SVOCs												
(mg/kg)	Anthracene	8	2	25.0%	0.0434	0.0803	SD-35	0.038	0.26	1.2E-01	8.0E-02	Max. of Detects
	Benzo(a)anthracene	8	4	50.0%	0.109	0.193	SD-30	0.038	0.26	1.4E-01	1.9E-01	Max. of Detects
	Benzo(a)pyrene	8	4	50.0%	0.0972	0.181	SD-35	0.038	0.26	1.3E-01	1.8E-01	Max. of Detects
	Benzo(b)fluoranthene	8	4	50.0%	0.0897	0.214	SD-30	0.038	0.26	1.4E-01	2.1E-01	Max. of Detects
	Benzo(g,h,i)perylene	8	4	50.0%	0.0835	0.16	SD-30	0.038	0.26	1.2E-01	1.6E-01	Max. of Detects
	Benzo(k)fluoranthene	8	4	50.0%	0.0596	0.152	SD-30	0.038	0.26	1.2E-01	1.5E-01	Max. of Detects
	Carbazole	8	1	12.5%	0.0305	0.0305	SD-33	0.076	0.52	2.5E-01	3.1E-02	Max. of Detects
	Chrysene	8	4	50.0%	0.139	0.255	SD-30	0.038	0.26	1.5E-01	2.6E-01	Max. of Detects
	Diethyl phthalate	8	1	12.5%	0.319	0.319	SD-30	0.076	0.52	2.4E-01	3.2E-01	Max. of Detects
	Dimethyl phthalate	8	4	50.0%	0.0721	1.14	SD-34	0.076	0.3	3.7E-01	1.1E+00	Max. of Detects
	bis(2-ethylhexyl)phthalate	8	5	62.5%	0.109	0.727	SD-30	0.076	0.52	3.1E-01	7.3E-01	Max. of Detects
	Fluoranthene	8	5	62.5%	0.154	0.31	SD-33	0.038	0.15	1.8E-01	3.1E-01	Max. of Detects
	Indeno(1,2,3-cd)pyrene	8	4	50.0%	0.0699	0.158	SD-30	0.038	0.26	1.2E-01	1.6E-01	Max. of Detects
	Phenanthrene	8	4	50.0%	0.156	0.196	SD-33	0.038	0.26	1.5E-01	2.0E-01	Max. of Detects
	Pyrene	8	5	62.5%	0.123	0.289	SD-30	0.038	0.15	1.7E-01	2.9E-01	Max. of Detects
Pesticides												
(mg/kg)	alpha-Chlordane	8	2	25.0%	0.0036	0.0837	SD-35	0.00079	0.0054	1.3E-02	8.4E-02	Max. of Detects
	gamma-Chlordane	8	1	12.5%	0.0812	0.0812	SD-35	0.00079	0.0054	1.3E-02	8.1E-02	Max. of Detects
	Dieldrin	8	1	12.5%	0.0073	0.0073	SD-33	0.00079	0.0054	3.5E-03	7.3E-03	Max. of Detects
	4,4'-DDD	8	4	50.0%	0.0029	0.136	SD-36	0.00079	0.0054	2.1E-02	1.4E-01	Max. of Detects
	4,4'-DDE	8	4	50.0%	0.0023	0.0143	SD-36	0.0012	0.0054	5.8E-03	1.4E-02	Max. of Detects
	4,4'-DDT	8	6	75.0%	0.0025	0.0415	SD-36	0.0049	0.0054	1.1E-02	4.2E-02	Max. of Detects
	Endosulfan sulfate	8	1	12.5%	0.0039	0.0039	SD-33	0.00079	0.0054	3.0E-03	3.9E-03	Max. of Detects
	Endosulfan-II	8	1	12.5%	0.0034	0.0034	SD-33	0.00079	0.0054	3.0E-03	3.4E-03	Max. of Detects
	Methoxychlor	8	1	12.5%	0.0082	0.0082	SD-31	0.0016	0.011	5.7E-03	8.2E-03	Max. of Detects
Metals, total												
(mg/kg)	Aluminum	8	8	100.0%	1130	21800	SD-34	--	--	8.3E+03	2.2E+04	Max. of Detects
	Arsenic	10	1	10.0%	2.3	2.3	SD-31	2	18	8.9E+00	2.3E+00	Max. of Detects
	Barium	8	6	75.0%	29.2	430	SD-30	28	99	1.6E+02	4.3E+02	Max. of Detects
	Beryllium	8	7	87.5%	0.59	6.4	SD-34	0.28	0.28	2.5E+00	6.4E+00	Max. of Detects
	Calcium	8	4	50.0%	859	5190	SD-30	690	2500	2.5E+03	5.2E+03	Max. of Detects
	Chromium	10	9	90.0%	2.7	38.3	SD-35	5	5	1.3E+01	1.9E+01	95% KM (t) UCL
	Cobalt	8	4	50.0%	7.4	166	SD-34	6.9	25	5.2E+01	1.7E+02	Max. of Detects
	Copper	10	5	50.0%	3.6	28.3	SD-35	2.5	20	1.4E+01	2.8E+01	Max. of Detects
	Iron	10	10	100.0%	1020	25200	SD-30	--	--	9.9E+03	1.5E+04	95% Student's-t UCL
	Lead	10	10	100.0%	4.8	91.9	SD-35	--	--	4.5E+01	6.4E+01	95% Student's-t UCL
	Manganese	10	10	100.0%	5.7	1260	SD-34	--	--	3.3E+02	8.6E+02	95% Approximate Gamma UCL
	Mercury	10	10	100.0%	0.13	12.7	SD-30	--	--	2.0E+00	7.2E+00	95% Chebyshev (Mean, Sd) UCL
	Nickel	10	7	70.0%	4.1	60.8	SD-34	5.6	21	2.0E+01	6.1E+01	Max. of Detects
	Vanadium	8	1	12.5%	5.4	5.4	SD-31	5	46	2.2E+01	5.4E+00	Max. of Detects
	Zinc	10	10	100.0%	3	197	SD-34	--	--	6.0E+01	1.3E+02	95% Approximate Gamma UCL

Table B-4
Statistics of Analytical Results for Reference Area Sediment Samples -- March 2009 and October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
General Chemistry												
(mg/kg)	Total Organic Carbon	10	10	100.0%	10600	248000	SD-35	--	--	1.5E+05	2.5E+05	Max. of Detects
(s.u.)	pH	10	10	100.0%	4.98	6.13	SD-30	--	--	5.7E+00	5.9E+00	95% Student's-t UCL

Notes:

mg/kg - milligrams per kilogram (or parts per million).

s.u. - Standard unit.

Table B-5
Statistics of Analytical Results for Eastern Storage Area Soil Samples
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
SVOCs												
	bis(2-ethylhexyl)phthalate	1	1	100.0%	0.085	0.085	RA-34	--	--	8.5E-02	8.5E-02	Max. of Detects
	Di-n-butyl phthalate	1	1	100.0%	0.21	0.21	RA-34	--	--	2.1E-01	2.1E-01	Max. of Detects
PCBs												
	Aroclor-1248	5	1	20.0%	1.9	1.9	RA-34	0.035	0.036	4.1E-01	1.9E+00	Max. of Detects
	Aroclor-1254	7	4	57.1%	0.016	1.5	RA-34	0.035	0.036	2.6E-01	1.5E+00	Max. of Detects
	Aroclor-1260	5	1	20.0%	0.022	0.022	SB-20	0.035	2	4.3E-01	2.2E-02	Max. of Detects
	Total PCBs	8	5	62.5%	0.016	3.4	RA-34	0.035	0.036	4.7E-01	3.4E+00	Max. of Detects
Metals, total												
	Aluminum	24	24	100.0%	952	104000	SB-28	--	--	1.9E+04	4.4E+04	95% Chebyshev (Mean, Sd) UCL
	Antimony	24	3	12.5%	5.45	13.8	RA-32	3.9	14	1.1E+01	1.4E+01	Max. of Detects
	Arsenic	24	23	95.8%	0.61	4.7	SB-20	2	2	1.9E+00	2.8E+00	95% KM (Chebyshev) UCL
	Barium	24	23	95.8%	9.3	683	RA-50	40.5	40.5	1.4E+02	3.0E+02	95% KM (Chebyshev) UCL
	Beryllium	23	21	91.3%	0.28	35.5	RA-49	1	1	6.8E+00	1.5E+01	95% KM (Chebyshev) UCL
	Boron	17	5	29.4%	59.5	208	RA-50	20.2	37.9	5.6E+01	2.1E+02	Max. of Detects
	Cadmium	24	3	12.5%	0.91	2.8	RA-29	0.61	1.2	1.1E+00	2.8E+00	Max. of Detects
	Calcium	24	23	95.8%	58.3	115000	SB-28	1010	1010	2.0E+04	5.1E+04	95% KM (Chebyshev) UCL
	Chromium (total)	29	29	100.0%	2.3	1100	SB-32	--	--	1.6E+02	2.4E+02	95% Approximate Gamma UCL
	Chromium (VI)	23	10	43.5%	0.14	2.7	RA-32	0.1	0.12	4.3E-01	6.8E-01	95% KM (t) UCL
	Cobalt	24	19	79.2%	1.185	19	RA-28	0.91	10.7	6.6E+00	7.1E+00	95% KM (Percentile Bootstrap) UCL
	Copper	24	24	100.0%	1.5	342	SB-20	--	--	3.0E+01	9.1E+01	95% Chebyshev (Mean, Sd) UCL
	Iron	24	24	100.0%	1610	27100	RA-28	--	--	8.9E+03	1.2E+04	95% Approximate Gamma UCL
	Lead	24	24	100.0%	3.62	331	SB-32	--	--	5.1E+01	7.7E+01	95% Approximate Gamma UCL
	Magnesium	24	23	95.8%	107	50500	RA-32	1010	1010	1.1E+04	4.5E+04	99% KM (Chebyshev) UCL
	Manganese	24	24	100.0%	6.3	3150	SB-21	--	--	6.3E+02	1.0E+03	95% Approximate Gamma UCL
	Mercury	24	1	4.2%	0.09	0.09	SB-23	0.06	0.11	9.3E-02	9.0E-02	Max. of Detects
	Nickel	24	23	95.8%	2	1110	RA-28	8.1	8.1	2.2E+02	4.6E+02	95% KM (Chebyshev) UCL
	Niobium	17	3	17.6%	46.35	69.7	RA-42	32.9	46.7	4.3E+01	7.0E+01	Max. of Detects
	Potassium	24	14	58.3%	169	1110	RA-32	155	1080	6.4E+02	4.8E+02	95% KM (t) UCL
	Selenium	22	1	4.5%	0.42	0.42	RA-51	0.42	11.7	2.3E+00	4.2E-01	Max. of Detects
	Silver	22	1	4.5%	2.3	2.3	SB-33	0.78	2.4	2.1E+00	2.3E+00	Max. of Detects
	Sodium	24	23	95.8%	59.6	1520	RA-34	1010	1010	3.9E+02	6.6E+02	95% KM (Chebyshev) UCL
	Strontium	17	4	23.5%	110	171	RA-34	20.2	228	5.9E+01	1.7E+02	Max. of Detects
	Titanium	17	17	100.0%	52.2	941	RA-28	--	--	2.2E+02	3.1E+02	95% H-UCL
	Vanadium	30	29	96.7%	14.1	4875	RA-49	5.1	5.1	1.0E+03	2.1E+03	95% KM (Chebyshev) UCL
	Zinc	24	24	100.0%	6	335	RA-56	--	--	8.7E+01	1.3E+02	95% Approximate Gamma UCL
	Zirconium	1	1	100.0%	101	101	RA-34	--	--	1.0E+02	1.0E+02	Max. of Detects
General Chemistry												
	Cyanide, Total	22	2	9.1%	0.52	0.5825	RA-49	1	1.1	1.0E+00	5.8E-01	Max. of Detects

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

Table B-6
Statistics of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
SVOCs												
	Acenaphthylene	22	9	40.9%	0.0148	0.149	SD-10N	0.031	0.11	4.4E-02	1.5E-01	Max. of Detects
	Anthracene	22	6	27.3%	0.0128	0.102	SD-10N	0.031	0.11	4.6E-02	1.0E-01	Max. of Detects
	Benzo(a)anthracene	19	16	84.2%	0.013	0.563	SD-18S	0.033	0.11	7.7E-02	2.5E-01	97.5% KM (Chebyshev) UCL
	Benzo(a)pyrene	22	9	40.9%	0.0182	0.866	SD-18S	0.031	0.11	9.5E-02	8.7E-01	Max. of Detects
	Benzo(b)fluoranthene	22	11	50.0%	0.0163	0.859	SD-18S	0.032	0.056	9.6E-02	1.6E-01	95% KM (t) UCL
	Benzo(ghi)perylene	22	9	40.9%	0.0128	0.697	SD-18S	0.031	0.11	8.2E-02	7.0E-01	Max. of Detects
	Benzo(k)fluoranthene	22	8	36.4%	0.0294	0.956	SD-18S	0.031	0.11	9.2E-02	9.6E-01	Max. of Detects
	Benzaldehyde	22	2	9.1%	0.0736	0.121	SD-04N	0.15	0.53	2.1E-01	1.2E-01	Max. of Detects
	Carbazole	22	1	4.5%	0.0577	0.0577	SD-18S	0.062	0.21	8.5E-02	5.8E-02	Max. of Detects
	Chrysene	19	16	84.2%	0.0151	1.02	SD-18S	0.033	0.11	1.1E-01	4.4E-01	97.5% KM (Chebyshev) UCL
	Dibenz(a,h)anthracene	22	2	9.1%	0.0227	0.159	SD-18S	0.031	0.11	4.9E-02	1.6E-01	Max. of Detects
	Dimethyl phthalate	22	15	68.2%	0.0284	0.202	SD-18S	0.062	0.21	9.2E-02	1.0E-01	95% KM (Percentile Bootstrap) UCL
	bis(2-ethylhexyl)phthalate	20	5	25.0%	0.0438	0.231	SD-18S	0.062	0.21	9.4E-02	2.3E-01	Max. of Detects
	Fluoranthene	22	17	77.3%	0.018	1.67	SD-18S	0.032	0.052	1.4E-01	6.1E-01	97.5% KM (Chebyshev) UCL
	Indeno(1,2,3-cd)pyrene	22	8	36.4%	0.0179	0.598	SD-18S	0.031	0.11	7.4E-02	6.0E-01	Max. of Detects
	Phenanthrene	22	13	59.1%	0.0179	0.494	SD-18S	0.031	0.11	7.3E-02	1.0E-01	95% KM (BCA) UCL
	Pyrene	19	17	89.5%	0.0211	1.54	SD-18S	0.033	0.052	1.7E-01	5.2E-01	95% KM (Chebyshev) UCL
PCBs												
	Aroclor-1248	22	1	4.5%	0.308	0.308	SD-18S	0.032	0.11	5.7E-02	3.1E-01	Max. of Detects
	Aroclor-1254	22	2	9.1%	0.0498	0.261	SD-18S	0.032	0.11	5.5E-02	2.6E-01	Max. of Detects
	Aroclor-1260	22	3	13.6%	0.0596	0.244	SD-13N-X	0.032	0.11	6.4E-02	2.4E-01	Max. of Detects
	Total PCBs	22	3	13.6%	0.1094	0.809	SD-18S	0.032	0.11	9.2E-02	8.1E-01	Max. of Detects
Pesticides												
	Aldrin	22	1	4.5%	0.0055	0.0055	SD-23S	0.00063	0.0019	1.1E-03	5.5E-03	Max. of Detects
	Dieldrin	22	1	4.5%	0.0042	0.0042	SD-23N	0.00063	0.0022	1.1E-03	4.2E-03	Max. of Detects
	4,4'-DDD	22	8	36.4%	0.0025	0.0452	SD-23S	0.00063	0.0019	4.6E-03	4.5E-02	Max. of Detects
	4,4'-DDE	22	12	54.5%	0.001	0.0478	SD-18N-X	0.00064	0.0019	9.7E-03	1.5E-02	95% KM (t) UCL
	4,4'-DDT	22	10	45.5%	0.0018	0.0621	SD-23S	0.00063	0.0019	8.6E-03	1.5E-02	95% KM (t) UCL
	Endosulfan sulfate	22	2	9.1%	0.0012	0.0084	SD-23S	0.00063	0.0019	1.3E-03	8.4E-03	Max. of Detects
Metals, total												
	Aluminum	45	45	100.0%	119	37400	RA-12	--	--	5.6E+03	7.3E+03	95% Approximate Gamma UCL
	Antimony	45	6	13.3%	2.4	19.4	SD-18S	2.1	44.6	7.7E+00	1.9E+01	Max. of Detects
	Arsenic	45	33	73.3%	0.7	20.5	SD-18S	0.25	3.9	3.5E+00	4.1E+00	95% KM (Percentile Bootstrap) UCL
	Barium	45	34	75.6%	4.1	739	RA-12	21	31	6.7E+01	1.5E+02	95% KM (Chebyshev) UCL
	Beryllium	45	27	60.0%	0.1	60.1	RA-12	0.22	1.4	2.4E+00	8.2E+00	95% KM (Chebyshev) UCL
	Cadmium	45	5	11.1%	0.41	5.3	RA-12	0.3	2	9.7E-01	5.3E+00	Max. of Detects
	Calcium	45	34	75.6%	35.9	7610	SD-23S	530	780	1.2E+03	2.2E+03	95% KM (Chebyshev) UCL
	Chromium (total)	70	69	98.6%	1.3	8940	SD-104A	1.1	1.1	6.7E+02	1.9E+03	97.5% KM (Chebyshev) UCL
	Chromium (VI)	45	15	33.3%	0.38	5.3	SS-17	0.1	1.4	8.2E-01	1.0E+00	95% KM (t) UCL
	Cobalt	45	12	26.7%	0.39	87.1	RA-12	0.39	19	9.4E+00	7.5E+00	95% KM (t) UCL
	Copper	62	56	90.3%	1.2	887	RA-12	2.7	3.2	3.6E+01	9.9E+01	95% KM (Chebyshev) UCL

Table B-6
Statistics of Analytical Results for Hudson Branch Wetland Soil Samples
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
	Iron	45	45	100.0%	206	32300	RA-12	--	--	6.8E+03	8.8E+03	95% Approximate Gamma UCL
	Lead	45	44	97.8%	2.9	760	RA-12	2.2	2.2	6.3E+01	1.4E+02	95% KM (Chebyshev) UCL
	Magnesium	45	26	57.8%	46.1	4380	RA-12	530	1600	7.7E+02	1.2E+03	95% KM (Chebyshev) UCL
	Manganese	45	45	100.0%	4.2	3250	SD-13N-X	--	--	2.3E+02	5.9E+02	95% Chebyshev (Mean, Sd) UCL
	Mercury	45	30	66.7%	0.056	0.93	SD-18S	0.031	0.12	2.0E-01	2.4E-01	95% KM (Percentile Bootstrap) UCL
	Nickel	62	49	79.0%	1.9	3360	RA-12	0.92	9.3	1.3E+02	5.1E+02	97.5% KM (Chebyshev) UCL
	Potassium	45	12	26.7%	76.3	1040	RA-12	59.4	3800	1.1E+03	4.5E+02	95% KM (t) UCL
	Selenium	45	11	24.4%	0.16	0.62	SS-18	0.13	7.6	2.0E+00	4.1E-01	95% KM (t) UCL
	Silver	45	3	6.7%	0.43	92.5	SD-13N-X	0.26	7.4	3.4E+00	9.3E+01	Max. of Detects
	Sodium	45	23	51.1%	23.8	598	SS-17	1100	3800	8.8E+02	2.3E+02	95% KM (t) UCL
	Thallium	45	1	2.2%	0.37	0.37	SS-18	0.21	21.4	2.3E+00	3.7E-01	Max. of Detects
	Titanium	14	14	100.0%	42.5	1480	RA-12	--	--	2.0E+02	6.3E+02	95% Chebyshev (Mean, Sd) UCL
	Vanadium	70	66	94.3%	8.8	12100	RA-12	5	6.3	5.1E+02	1.6E+03	97.5% KM (Chebyshev) UCL
	Zinc	45	43	95.6%	3.5	1310	RA-12	2.2	2.5	7.5E+01	2.1E+02	95% KM (Chebyshev) UCL
General Chemistry												
	Total Organic Carbon	1	1	100.0%	42200	42200	SD-13N	--	--	4.2E+04	4.2E+04	Max. of Detects
(s.u.)	pH	23	23	100.0%	3.86	7.5	SD-13N-X	--	--	5.8E+00	6.1E+00	95% Student's-t UCL

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

s.u. - Standard units.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

UCL - Upper confidence level.

Table B-7
Statistics of Analytical Results for Reference Area Soil Samples
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
Metals, total												
(mg/k	Aluminum	13	13	100.0%	2920	15900	BG-5	--	--	7.4E+03	9.1E+03	95% Student's-t UCL
	Arsenic	13	9	69.2%	2.4	6.8	BG-5	2	2.4	3.1E+00	6.8E+00	Max. of Detects
	Barium	13	3	23.1%	25.2	47.8	BG-5	20	24	2.5E+01	4.8E+01	Max. of Detects
	Beryllium	13	3	23.1%	0.25	0.33	BG-5	0.2	0.24	2.4E-01	3.3E-01	Max. of Detects
	Calcium	13	1	7.7%	823	823	BG-5	500	610	5.8E+02	8.2E+02	Max. of Detects
	Chromium (total)	15	15	100.0%	1.9	18.3	BG-5	--	--	9.4E+00	1.1E+01	95% Student's-t UCL
	Chromium (VI)	13	5	38.5%	0.53	1.1	BG-1	0.43	0.59	5.7E-01	1.1E+00	Max. of Detects
	Cobalt	13	1	7.7%	6.2	6.2	BG-5	5	6.1	5.7E+00	6.2E+00	Max. of Detects
	Copper	13	5	38.5%	3	9.8	BG-5	2.5	3	3.9E+00	9.8E+00	Max. of Detects
	Iron	13	13	100.0%	2510	15800	BG-5	--	--	8.8E+03	1.1E+04	95% Student's-t UCL
	Lead	13	13	100.0%	5.4	35.3	BG-5	--	--	1.2E+01	1.6E+01	95% Approximate Gamma UCL
	Magnesium	13	1	7.7%	887	887	BG-5	500	610	5.9E+02	8.9E+02	Max. of Detects
	Manganese	13	13	100.0%	11.4	107	BG-5	--	--	3.7E+01	5.0E+01	95% Approximate Gamma UCL
	Mercury	13	4	30.8%	0.044	0.17	BG-11	0.032	0.047	6.3E-02	1.7E-01	Max. of Detects
	Nickel	13	4	30.8%	4.5	8.4	BG-5	4	4.9	4.8E+00	8.4E+00	Max. of Detects
	Vanadium	15	13	86.7%	6.8	28	BG-5	5.1	5.6	1.4E+01	1.7E+01	95% KM (t) UCL
	Zinc	13	13	100.0%	5.6	50.6	BG-5	--	--	1.6E+01	2.1E+01	95% Approximate Gamma UCL
General Chemistry												
(s.u.)	pH	13	13	100.0%	4.13	6.12	BG-5	--	--	4.7E+00	5.0E+00	95% Approximate Gamma UCL

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

s.u. - Standard units.

SVOCs - Semivolatile Organic Compounds.

PCBs - Polychlorinated Biphenyls.

UCL - Upper confidence level.

Table B-8
Statistics of Analytical Results for Hudson Branch Aquatic Vegetation Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
Metal, total												
	Chromium	8	8	100.0%	18.9	737	BERA-AV-08	--	--	2.67E+02	7.37E+02	Max. of Detects

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

UCL - Upper confidence level.

Table B-9
Statistics of Analytical Results for Reference Area Aquatic Vegetation Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
Metal, total												
	Chromium	2	2	100.0%	6.12	12	BERA-AV-09	--	--	9.1E+00	1.2E+01	Max. of Detects

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

UCL - Upper confidence level.

Table B-10
Statistics of Analytical Results for Hudson Branch Aquatic Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
Metals, total												
	Barium	8	8	100.0%	16.6	120	BERA-AI-05	--	--	5.4E+01	1.2E+02	Max. of Detects
	Chromium	8	8	100.0%	26.31	519	BERA-AI-08	--	--	1.9E+02	5.2E+02	Max. of Detects
	Copper	8	8	100.0%	33.2	150	BERA-AI-02	--	--	6.7E+01	1.5E+02	Max. of Detects
	Mercury	8	6	75.0%	0.173	0.569	BERA-AI-03	0.181	0.196	3.7E-01	5.7E-01	Max. of Detects
	Vanadium	8	8	100.0%	19.54	656	BERA-AI-05	--	--	1.6E+02	6.6E+02	Max. of Detects

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

UCL - Upper confidence level.

Table B-11
Statistics of Analytical Results for Reference Area Aquatic Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
Metals, total												
	Barium	2	2	100.0%	10.8	34.13	BERA-AI-09	--	--	2.2E+01	3.4E+01	Max. of Detects
	Chromium	2	2	100.0%	5.49	8	BERA-AI-09	--	--	6.7E+00	8.0E+00	Max. of Detects
	Copper	2	2	100.0%	15.06	26.9	BERA-AI-10	--	--	2.1E+01	2.7E+01	Max. of Detects
	Mercury	2	2	100.0%	0.919	1.26	BERA-AI-10	--	--	1.1E+00	1.3E+00	Max. of Detects
	Vanadium	2	1	50.0%	3.63	3.63	BERA-AI-09	3.24	3.24	3.4E+00	3.6E+00	Max. of Detects

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

UCL - Upper confidence level.

Table B-12
Statistics of Analytical Results for Eastern Storage Area Terrestrial Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
Metals, total												
	Chromium	6	6	100.0%	5.23	116	BERA-TI-11	--	--	4.4E+01	1.2E+02	Max. of Detects
	Vanadium	6	5	83.3%	8.96	189	BERA-TI-11	3.77	3.77	5.1E+01	1.9E+02	Max. of Detects

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

UCL - Upper confidence level.

Table B-13
Statistics of Analytical Results for Hudson Branch Wetland Terrestrial Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
Metals, total												
	Chromium	7	7	100.0%	7.13	829	BERA-TI-02	--	--	1.7E+02	8.3E+02	Max. of Detects
	Vanadium	7	6	85.7%	35.9	168	BERA-TI-02	6.32	6.32	7.0E+01	1.7E+02	Max. of Detects

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

UCL - Upper confidence level.

Table B-14
Statistics of Analytical Results for Reference Area Terrestrial Invertebrate Samples -- October 2011
SMC Facility
Newfield, New Jersey

	Analyte	# of Samples	# of Detects	Freq. of Detects	Min. of Detects (mg/kg)	Max. of Detects (mg/kg)	Location of Maximum Detect	Min. of Non-Detects	Max. of Non-Detects	Mean Concentration (mg/kg)	UCL Mean (mg/kg)	UCL Rationale
Metals, total												
	Chromium	2	2	100.0%	14	16.8	BERA-TI-16	--	--	1.5E+01	1.7E+01	Max. of Detects
	Vanadium	2	2	100.0%	9.45	9.77	BERA-TI-15	--	--	9.6E+00	9.8E+00	Max. of Detects

Notes:

mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).

UCL - Upper confidence level.

APPENDIX C
NEW JERSEY NATURAL HERITAGE PROGRAM RESPONSE

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Parks and Forestry
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

March 29, 2012

Jacqueline Fusco
TRC Environmental Corporation
1200 Wall Street West, 2nd Floor
Lyndhurst, NJ 07071

Re: Shieldalloy Metallurgical Corporation - Newfield Facility

Dear Ms. Fusco:

Thank you for your data request regarding rare species information for the above referenced project site in Vineland City, Cumberland County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the vicinity of the site.

A list of rare plant species and ecological communities that have been documented from Cumberland County can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, http://www.state.nj.us/dep/gis/geowebsplash.htm or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 12-3907551-1082

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Division of Land Use Regulation, P.O. Box 439, Trenton, NJ 08625-0439.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program in order to map critical habitat for rare animal species. Natural Heritage Database response letters will also list all species (if any) found during a search of the Landscape Project. However, this office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.

NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

Table 1: On Site Data Request Search Results (7 Possible Reports)

Rare Plants/Ecological Communities Possibly On Site:	No
Rare Plants/Ecological Communities On Site/Immediate Vicinity:	No
Natural Heritage Priority Sites On Site:	No
Landscape 3.1 Species Based Patches On Site:	Yes
Landscape 3.1 Vernal Pool Habitat On Site:	No
Landscape 3.1 Stream/Mussel Habitat On Site:	No
Other Animals Tracked by ENSP On Site:	Yes

Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection	State Protection	Grank	Srank
Aves								
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Wood Thrush	Hylocichla mustelina	Breeding Sighting	2	NA	Special Concern	G5	S3B

Other Animal Species
On the Project Site Based on
Additional Species Tracked by
Endangered and Nongame Species Program

Scientific Name	Common Name	Federal Protection Status	State Protection Status	Grank	Srank
Invertebrate Animals					
Metarranthis pilosaria	Coastal Bog Metarranthis			G3G4	S3S4

Total number of records: 1

Table 2: Vicinity Data Request Search Results (6 possible reports)

Rare Plants/Ecological Communities within the Vicinity:	No
Natural Heritage Priority Sites within the Vicinity:	No
Landscape 3.1 Species Based Patches within the Vicinity:	Yes
Landscape 3.1 Vernal Pool Habitat within the Vicinity:	No
Landscape 3.1 Stream/Mussel Habitat within the Vicnity:	No
Other Animals Tracked by ENSP within the Vicnity:	Yes

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.1 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection	State Protection	Grank	Srank
Aves								
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Wood Thrush	Hylocichla mustelina	Breeding Sighting	2	NA	Special Concern	G5	S3B

Other Animal Species
In the Immediate Vicinity of the Project Site based on Additional Species Tracked by Endangered and Nongame Species Program

Scientific Name	Common Name	Federal Protection Status	State Protection Status	Grank	Srank
Invertebrate Animals					
Metarranthis pilosaria	Coastal Bog Metarranthis			G3G4	S3S4

Total number of records: 1

APPENDIX D
LABORATORY TOXICITY TEST REPORT

Aquatec Biological Sciences, Inc.
273 Commerce Street
Williston, VT 05495
Tel: (802) 860 - 1638 Fax: (802) 658 - 3189

SDG: 12885
Project: 11050

TRC
Wannalancit Mills
650 Suffolk St
Lowell, MA 01854

Tel: (978) 656-3583
Fax: (978) 453-1995

E-Mail: sheim@trcsolutions.com

Toxicity Summary Report

Project: TRC SMC 002 Supplemental

Method: 100.4 Species: *Hyalella azteca*

Sample	Sample ID	Control Group:	Percent Survival (%) 28	35	42	Growth (mg) 28	42	Reproduction (Neonates/Female) 42
041686	Control	A	91.3	91.3	87.5		0.33	3.69
041687	SD-23	A	96.3	96.3	95.0		0.37	4.37
041688	SD-04	A	98.8	98.8	96.4		0.33	2.62 *
041689	SD-18	A	2.5 *	2.5 *	1.3 *		0.40	0.00 *
041690	SD-15	A	88.8	87.5	83.8		0.37	3.64
041739	SD-31	A	96.3	96.3	91.3		0.33	3.17
041740	SD-35A	A	96.3	93.8	81.3		0.35	5.11
041741	SD-13	A	100.0	97.5	96.3		0.36	3.37
041742	SD-10	A	87.5	85.0	83.8		0.35	2.85

* = Indicates a statistically significant reduction ($P<0.05$) in the response relative to the corresponding response in the laboratory control A.

Samples Received

Number	Sample Name	Date Time and Collected		Type
41686	Control	10/19/2011	8:00:00 AM	Sediment
41687	SD-23	10/6/2011	1:30:00 PM	Sediment
41688	SD-04	10/6/2011	5:50:00 PM	Sediment
41689	SD-18	10/7/2011	10:45:00 AM	Sediment
41690	SD-15	10/7/2011	2:00:00 PM	Sediment
41739	SD-31	10/10/2011	1:30:00 PM	Sediment
41740	SD-35A	10/11/2011	9:45:00 AM	Sediment
41741	SD-13	10/12/2011	8:00:00 AM	Sediment
41742	SD-10	10/12/2011	1:45:00 PM	Sediment

Submitted By:

Wednesday, December 21, 2011

Aquatec Biological Sciences

Aquatec Biological Sciences, Inc.
273 Commerce Street
Williston, VT 05495
Tel: (802) 860 - 1638 Fax: (802) 658 - 3189

SDG: 12885
Project: 11050

TRC
Wannalancit Mills
650 Suffolk St
Lowell, MA 01854

Tel: (978) 656-3583
Fax: (978) 453-1995

E-Mail: sheim@trcsolutions.com

Toxicity Summary Report

Project: TRC SMC 002 Supplemental

100.4-28H Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

Sample ID	Sample Name	Control Group	Mean Percent Surviving (%)	Mean Weight (mg) Growth
041686	Control	A	87.5	0.237
041687	SD-23	A	95.0	0.267
041688	SD-04	A	97.5	0.283
041689	SD-18	A	0.0 *	*
041690	SD-15	A	95.0	0.240
041739	SD-31	A	95.0	0.251
041740	SD-35A	A	95.0	0.314
041741	SD-13	A	97.5	0.249
041742	SD-10	A	92.5	0.197

* Indicates a statistically significant reduction (P<0.05) in the response relative to the corresponding response in the laboratory control sample.

Samples Tested

Number	Sample Name	Date Time and Collected	Type
41686	Control	10/19/2011 8:00:00 AM	Sediment
41687	SD-23	10/6/2011 1:30:00 PM	Sediment
41688	SD-04	10/6/2011 5:50:00 PM	Sediment
41689	SD-18	10/7/2011 10:45:00 AM	Sediment
41690	SD-15	10/7/2011 2:00:00 PM	Sediment
41739	SD-31	10/10/2011 1:30:00 PM	Sediment
41740	SD-35A	10/11/2011 9:45:00 AM	Sediment
41741	SD-13	10/12/2011 8:00:00 AM	Sediment
41742	SD-10	10/12/2011 1:45:00 PM	Sediment

Submitted By:

Wednesday, December 21, 2011

Aquatec Biological Sciences, Inc.
273 Commerce Street
Williston, VT 05495
Tel: (802) 860 - 1638 Fax: (802) 658 - 3189

SDG: 12885
Project: 11050

TRC
Wannalancit Mills
650 Suffolk St
Lowell, MA 01854

Tel: (978) 656-3583
Fax: (978) 453-1995

E-Mail: sheim@trcsolutions.com

Toxicity Detail Report

Sample ID **41686** Sample Name: Control Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count 0	Total Surviving 28	Initial Weight (mg) 28	Total Dry Weight (mg) 28	Weighed 28	Mean Replicate Weight 28	Total Surviving 35	Neonates 35	Total Surviving 42	Neonates 42	Total Neonates 35/42	Females 42	Neonates per Female 42	Initial Weight (mg) 42	Total Dry Weight (mg) 42	Weighed 42	Mean Replicate Weight 42
A	10	9					9	8	9	13	21	6	3.5	25.80	29.20	9	0.38
B	10	10					10	4	9	2	6	2	3.0	25.91	28.38	9	0.27
C	10	10					10	12	9	12	24	5	4.8	25.21	28.08	9	0.32
D	10	10					10	4	9	5	9	4	2.3	25.92	28.71	9	0.31
E	10	10					10	9	10	6	15	4	3.8	25.22	28.33	10	0.31
F	10	9					9	22	9	0	22	5	4.4	25.23	28.34	9	0.35
G	10	6					6	4	6	16	20	4	5.0	24.73	27.00	6	0.38
H	10	9					9	3	9	14	17	6	2.8	25.80	28.67	9	0.32

Mean Percent Surviving on Day 28 (%): **91.3**
Mean Percent Surviving on Day 35 (%): **91.3**
Mean Percent Surviving on Day 42 (%): **87.5**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.33**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **3.69**

Toxicity Detail Report

Sample ID **41687** Sample Name: SD-23 Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count	Total Surviving	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight	Total Surviving	Neonates	Total Surviving	Neonates	Total Neonates	Females	Neonates per Female	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight
	0	28	28	28	28	28	35	35	42	42	35/42	42	42	42	42	42	42
A	10	10					10	4	10	7	11	4	2.8	24.68	28.17	10	0.35
B	10	10					10	14	10	25	39	7	5.6	25.06	28.67	10	0.36
C	10	10					10	2	10	5	7	5	1.4	24.66	27.98	10	0.33
D	10	9					9	8	9	15	23	4	5.8	25.28	29.30	9	0.45
E	10	9					9	15	8	14	29	6	4.8	24.08	27.17	8	0.39
F	10	10					10	5	10	8	13	6	2.2	24.46	27.44	10	0.30
G	10	10					10	5	10	17	22	4	5.5	23.84	27.25	10	0.34
H	10	9					9	6	9	8	14	2	7.0	24.98	28.82	9	0.43

Mean Percent Surviving on Day 28 (%): **96.3**
Mean Percent Surviving on Day 35 (%): **96.3**
Mean Percent Surviving on Day 42 (%): **95.0**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.37**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **4.37**

Sample ID **41688** Sample Name: SD-04 Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count	Total Surviving	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight	Total Surviving	Neonates	Total Surviving	Neonates	Total Neonates	Females	Neonates per Female	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight
	0	28	28	28	28	28	35	35	42	42	35/42	42	42	42	42	42	42
A	10	10					10	8	10	9	17	5	3.4	25.66	28.81	10	0.31
B	10	10					10	4	9	2	6	2	3.0	24.71	27.68	9	0.33
C	10	10					10	3	10	5	8	6	1.3	24.52	27.51	10	0.30
D	11	11					11	9	10	10	19	6	3.2	25.06	28.28	10	0.32
E	10	10					10	10	10	12	22	8	2.8	25.92	29.43	10	0.35
F	10	9					9	9	9	6	15	7	2.1	25.70	28.88	9	0.35
G	10	10					10	1	10	7	8	5	1.6	24.55	27.42	10	0.29
H	10	10					10	9	10	9	18	5	3.6	25.05	28.70	10	0.37

Mean Percent Surviving on Day 28 (%): **98.8**
Mean Percent Surviving on Day 35 (%): **98.8**
Mean Percent Surviving on Day 42 (%): **96.4**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.33**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **2.62**

Toxicity Detail Report

Sample ID **41689** Sample Name: SD-18 Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count	Total Surviving	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight	Total Surviving	Neonates	Total Surviving	Neonates	Total Neonates	Females	Neonates per Female	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight
	0	**28**	**28**	**28**	**28**	**28**	**35**	**35**	**42**	**42**	**35/42**	**42**	**42**	**42**	**42**	**42**	**42**
A	10	0					0	0	0	0	0	0	0.0				
B	10	0					0	0	0	0	0	0	0.0				
C	10	0					0	0	0	0	0	0	0.0				
D	10	0					0	0	0	0	0	0	0.0				
E	10	1					1	0	1	0	0	1	0.0	24.96	25.36	1	0.40
F	10	0					0	0	0	0	0	0	0.0				
G	10	0					0	0	0	0	0	0	0.0				
H	10	1					1	0	0	0	0	0	0.0				

Mean Percent Surviving on Day 28 (%): **2.5**
Mean Percent Surviving on Day 35 (%): **2.5**
Mean Percent Surviving on Day 42 (%): **1.3**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.40**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **0.00**

Sample ID **41690** Sample Name: SD-15 Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count	Total Surviving	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight	Total Surviving	Neonates	Total Surviving	Neonates	Total Neonates	Females	Neonates per Female	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight
	0	**28**	**28**	**28**	**28**	**28**	**35**	**35**	**42**	**42**	**35/42**	**42**	**42**	**42**	**42**	**42**	**42**
A	10	7					7	3	7	0	3	2	1.5	24.36	27.33	7	0.42
B	10	10					10	5	9	19	24	4	6.0	24.14	27.06	9	0.32
C	10	9					8	11	7	17	28	4	7.0	24.61	27.27	7	0.38
D	10	8					8	7	7	4	11	3	3.7	24.92	28.02	7	0.44
E	10	9					9	4	9	3	7	5	1.4	24.63	27.93	9	0.37
F	10	9					9	0	9	19	19	7	2.7	24.95	28.54	9	0.40
G	10	10					10	4	10	19	23	6	3.8	25.33	28.29	10	0.30
H	10	9					9	6	9	9	15	5	3.0	24.75	27.84	9	0.34

Mean Percent Surviving on Day 28 (%): **88.8**
Mean Percent Surviving on Day 35 (%): **87.5**
Mean Percent Surviving on Day 42 (%): **83.8**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.37**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **3.64**

Toxicity Detail Report

Sample ID **41739** Sample Name: SD-31 Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count	Total Surviving	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight	Total Surviving	Neonates	Total Surviving	Neonates	Total Neonates	Females	Neonates per Female	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight
	0	28	28	28	28	28	35	35	42	42	35/42	42	42	42	42	42	42
A	10	10					10	4	10	11	15	5	3.0	25.75	28.88	10	0.31
B	10	10					10	9	10	2	11	5	2.2	24.47	27.79	10	0.33
C	10	9					9	2	9	2	4	2	2.0	24.50	27.49	9	0.33
D	10	10					10	13	9	7	20	7	2.9	25.47	28.24	9	0.31
E	10	10					10	9	9	3	12	5	2.4	24.77	27.69	9	0.32
F	10	9					9	19	8	2	21	4	5.3	24.49	27.23	8	0.34
G	10	9					9	11	8	5	16	3	5.3	24.99	28.07	8	0.38
H	10	10					10	7	10	0	7	3	2.3	25.43	28.45	10	0.30

Mean Percent Surviving on Day 28 (%): **96.3**
Mean Percent Surviving on Day 35 (%): **96.3**
Mean Percent Surviving on Day 42 (%): **91.3**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.33**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **3.17**

Sample ID **41740** Sample Name: SD-35A Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count	Total Surviving	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight	Total Surviving	Neonates	Total Surviving	Neonates	Total Neonates	Females	Neonates per Female	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight
	0	28	28	28	28	28	35	35	42	42	35/42	42	42	42	42	42	42
A	10	10					10	9	9	2	11	4	2.8	25.05	28.26	9	0.36
B	10	9					9	5	8	2	7	3	2.3	26.18	29.19	8	0.38
C	10	10					10	10	10	8	18	5	3.6	24.93	27.96	9	0.34
D	10	9					9	4	8	8	12	3	4.0	27.77	30.72	8	0.37
E	10	10					9	7	5	8	15	1	15.0	25.15	26.98	5	0.37
F	10	9					9	18	8	9	27	5	5.4	25.18	28.10	8	0.37
G	10	10					9	8	8	16	24	6	4.0	25.28	27.83	8	0.32
H	10	10					10	15	9	8	23	6	3.8	24.75	27.64	9	0.32

Mean Percent Surviving on Day 28 (%): **96.3**
Mean Percent Surviving on Day 35 (%): **93.8**
Mean Percent Surviving on Day 42 (%): **81.3**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.35**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **5.11**

Toxicity Detail Report

Sample ID **41741** Sample Name: SD-13 Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count	Total Surviving	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight	Total Surviving	Neonates	Total Surviving	Neonates	Total Neonates	Females	Neonates per Female	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight
	0	28	28	28	28	28	35	35	42	42	35/42	42	42	42	42	42	42
A	10	10					10	11	10	10	21	5	4.2	25.67	28.95	10	0.33
B	10	10					9	5	9	2	7	2	3.5	26.09	29.70	9	0.40
C	10	10					10	5	10	4	9	5	1.8	25.41	28.74	10	0.33
D	10	10					10	17	10	14	31	7	4.4	24.95	27.82	10	0.29
E	10	10					10	10	10	5	15	6	2.5	25.95	29.22	10	0.33
F	10	10					10	0	10	6	6	2	3.0	26.06	30.26	10	0.42
G	10	10					9	6	9	6	12	3	4.0	24.08	27.65	9	0.40
H	10	10					10	0	9	7	7	2	3.5	25.53	28.92	9	0.38

Mean Percent Surviving on Day 28 (%): **100.0**
Mean Percent Surviving on Day 35 (%): **97.5**
Mean Percent Surviving on Day 42 (%): **96.3**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.36**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **3.37**

Sample ID **41742** Sample Name: SD-10 Species: *Hyalella azteca*

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Rep	Start Count	Total Surviving	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight	Total Surviving	Neonates	Total Surviving	Neonates	Total Neonates	Females	Neonates per Female	Initial Weight (mg)	Total Dry Weight (mg)	Weighed	Mean Replicate Weight
	0	28	28	28	28	28	35	35	42	42	35/42	42	42	42	42	42	42
A	10	9					8	0	8	3	3	3	1.0	24.35	27.26	8	0.36
B	10	9					9	17	9	11	28	7	4.0	25.10	28.28	9	0.35
C	10	10					9	3	9	15	18	7	2.6	24.38	27.09	9	0.30
D	10	9					9	0	9	8	8	3	2.7	24.61	27.82	9	0.36
E	10	10					10	0	10	5	5	4	1.3	25.87	28.85	10	0.30
F	10	6					6	0	5	14	14	2	7.0	25.39	27.50	5	0.42
G	10	9					9	4	9	10	14	6	2.3	24.74	27.55	9	0.31
H	10	8					8	0	8	6	6	3	2.0	24.78	27.64	8	0.36

Mean Percent Surviving on Day 28 (%): **87.5**
Mean Percent Surviving on Day 35 (%): **85.0**
Mean Percent Surviving on Day 42 (%): **83.8**

Mean Growth (mg) on Day 28:
Mean Growth (mg) on Day 42: **0.35**

Mean # Neonates (Days 35 plus 42) Per Surviving Female: **2.85**

Aquatec Biological Sciences, Inc.

273 Commerce Street
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Tel: (802) 860 - 1638 Fax: (802) 658 - 3189

SDG: 12885
Project: 11050

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Fax: (978) 453-1995

E-Mail: sheim@trcsolutions.com

Toxicity Detail Report

Project: TRC SMC 002 Supplemental

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

Sample ID: 41686 : Control

Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	10	100	25.18	27.50	10	0.232
B	10	9	90	25.15	27.27	9	0.236
C	10	9	90	25.26	27.30	9	0.227
D	10	7	70	25.49	27.26	7	0.253

Mean Percent Surviving (%) **87.5** Mean Growth Weight (mg) **0.237**

Sample ID: 41687 : SD-23

Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	10	100	25.03	27.97	10	0.294
B	10	10	100	24.45	26.49	10	0.204
C	10	9	90	26.01	27.53	8	0.190
D	10	9	90	26.40	29.81	9	0.379

Mean Percent Surviving (%) **95.0** Mean Growth Weight (mg) **0.267**

Sample ID: 41688 : SD-04

Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	9	90	25.41	28.28	9	0.319
B	10	10	100	25.42	28.58	10	0.316
C	10	10	100	24.53	27.31	10	0.278
D	10	10	100	26.93	29.11	10	0.218

Mean Percent Surviving (%) **97.5** Mean Growth Weight (mg) **0.283**

Toxicity Detail Report

Project: TRC SMC 002 Supplemental

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

Sample ID: 41689 : SD-18

Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	0	0				
B	10	0	0				
C	10	0	0				
D	10	0	0				

Mean Percent Surviving (%) **0.0** Mean Growth Weight (mg)

Sample ID: 41690 : SD-15

Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	9	90	24.64	27.08	9	0.271
B	10	9	90	25.52	27.50	9	0.220
C	10	10	100	26.34	28.63	10	0.229
D	10	10	100	23.52	25.92	10	0.240

Mean Percent Surviving (%) **95.0** Mean Growth Weight (mg) **0.240**

Sample ID: 41739 : SD-31

Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	9	90	25.03	27.65	9	0.291
B	10	9	90	25.43	27.19	9	0.196
C	10	10	100	25.54	28.28	10	0.274
D	10	10	100	25.30	27.75	10	0.245

Mean Percent Surviving (%) **95.0** Mean Growth Weight (mg) **0.251**

Sample ID: 41740 : SD-35A

Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	10	100	25.41	28.21	10	0.280
B	10	9	90	25.42	28.42	9	0.333
C	10	9	90	24.27	27.06	9	0.310
D	10	10	100	24.14	27.46	10	0.332

Mean Percent Surviving (%) **95.0** Mean Growth Weight (mg) **0.314**

Toxicity Detail Report

Project: TRC SMC 002 Supplemental

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

Sample ID: **41741 : SD-13** Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	9	90	24.18	25.80	9	0.180
B	10	10	100	25.20	27.64	10	0.244
C	10	10	100	25.85	28.62	10	0.277
D	10	10	100	25.19	28.15	10	0.296

Mean Percent Surviving (%) **97.5** Mean Growth Weight (mg) **0.249**

Sample ID: **41742 : SD-10** Species: ***Hyalella azteca***

Replicate	Start Count	Total Surviving	Percent Surviving (%)	Pan Weight	Dry Weight	Weighed	Mean Replicate Weight (mg)
A	10	10	100	25.37	27.81	10	0.244
B	10	8	80	26.87	28.15	8	0.160
C	10	9	90	25.01	27.11	9	0.233
D	10	10	100	25.71	27.20	10	0.149

Mean Percent Surviving (%) **92.5** Mean Growth Weight (mg) **0.197**

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Aquatec Biological Sciences
Certification Number 1737

Quality Assurance Report

SDG: 12885
Project: 11050

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E-Mail: sheim@trcsolutions.com

Project: **TRC SMC 002 Supplemental**

Narrative

Sediment samples were delivered to Aquatec Biological Sciences, Inc. (Aquatec) on October 8, 2011 (SD-23, SD-04, SD-18, SD-15) and October 15, 2011 (SD-31, SD-35A, SD-13, SD-10). The Chain-of-Custody documentation received with the samples delivered on October 8 did not have the date and time of collection recorded on the form. This information was sent to us by e-mail (copy of revised Chain-of-Custody form).

Control sediment was a mixture of sediment collected from the Lamoille River (sandy sediment) and Lake Arrowhead (fine, more organic-appearing sediment), Vermont collected on October 6 and 19, respectively. The control sediment was sieved through a 0.5-mm screen in the field to remove indigenous organisms and vegetative detritus.

Prior to distributing sediments to the exposure system , the sediments were press-sieved through a 1-mm mesh screen to remove vegetative material and as a measure to ensure that indigenous organisms were not introduced to the testing system (no indigenous organisms were seen). Sediments and overlying water were distributed to replicate test beakers on October 19, 2011. Organisms were distributed to test replicates on the following day, October 20, 2011.

The original plan for these tests was to perform Hyalella azteca 28-day survival and growth tests (EPA Method 100.4 modified for 28 days). The 28-day exposure period does not provide enough time to yield reproduction data. On November 2, 2011 the TRC Project Director requested that we continue the test for 42 days so that reproduction data could be produced. Reproduction data can be quite variable, therefore Aquatec suggested that we continue all eight replicates (for each sample) through the reproduction phase and not sacrifice any replicates for Day 28 growth data. Therefore on Day 28 (November 17, 2011), surviving amphipods were recovered from each replicate and transferred to water-only exposure (as specified in the EPA protocol for Method 100.4). The 42-day exposure was completed on December 1, 2011 with final survival, reproduction, and growth (dry weight) data recorded at that time.

In order to address the lack of Day 28 growth data in the above exposure scenario, Aquatec set up four additional sediment replicates for each sample on November 3, 2011 with organisms added the following day. These tests were completed on Day 28, December 2, 2011 when survival and growth (dry weight) data were recorded.

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Project: **TRC SMC 002 Supplemental**

For the 42-day test, eleven rather than ten amphipods were recovered from Replicate D of Sample 41688 on Day 28. Apparently this replicate received on extra amphipod when the tests were started. For Replicate C of Sample 41740 (SD-35A) ten amphipods were recovered on Day 42. When the amphipods from this replicate were transferred to the weigh pans, only nine were present. It is possible that one amphipod was lost during transfer to the holding cup. For reporting and statistical analysis, the data were used as recorded (ten alive, nine weighed).

For the 28-day test, Sample 41687 (SD-23) Replicate C, nine surviving amphipods were recovered however at the time of transfer to the weigh pan only eight were in the cup. Apparently one amphipod was lost during transfer. For reporting and statistical analysis, the data were used as recorded (nine alive, eight weighed).

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Project: **TRC SMC 002 Supplemental**

TOXICITY TEST REPORT CERTIFICATION

The results reported relate only to the the samples submitted as received.

I certify under penalty of law that this document and all ATTACHMENTs were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on: 12/21/11
(Date)

(Authorized Signature)
John Williams
Toxicity Laboratory Manager
Aquatec Biological Sciences, Inc.

Supportive Documentation

Chain-Of-Custody

Toxicity Test Methods

100.4 - Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

100.4-28Ha - Amphipod, H. azteca, 28-D Survival and Growth Test

Standard Reference Toxicant Control Charts

Chain-Of-Custody

Aquatec Biological Sciences

Chain-of-Custody-Record

273 Commerce Street
Williston, VT 05495
TEL: (802) 860-1638
FAX: (802) 658-3189

COMPANY INFORMATION	COMPANY'S PROJECT INFORMATION	SHIPPING INFORMATION	VOLUME/CONTAINER TYPE/ PRESERVATIVE
Name: TRC Address 1500 Market St City/State/Zip: Philadelphia PA 19102 Telephone: (508) 320-2678 Facsimile: Contact Name: Scott Hern	Project Name: SMC 002 Supplement XI Project Number: 112434.00002.0031 Sampler Name(s): C. Carlson, D. Daraghey + L. Ronsen Quote #: Client Code:	Carrier: Fed Ex Airbill Number: 8757 2282 8616 Date Shipped: 10/7/11 Hand Delivered: ☐ Yes ☐ No	1/2 gal / Plastic Bucket / Ice

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS	NUMBER OF CONTAINERS					
SD-23			X			Aquatic Toxicity EPA/600/R-99/064	X					
SD-04			X			Method 100.4	X					
SD-18			X			↓	X					
16 SD-15			X			↓	X					

Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
[signature]	10/7/11	1830	
Relinquished by: (signature)	10-8-11	0945	J. Garrison
Relinquished by: (signature)			

NOTES TO SAMPLER(S): Cooler Temp. = 0°C

NOTES TO LAB: Custody seal G22

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

R2-0001684

Aquatec Biological Sciences

Chain-of-Custody Record

273 Commerce Street
Williston, VT 05495
TEL: (802) 860-1638
FAX: (802) 658-3189

COMPANY INFORMATION	COMPANY'S PROJECT INFORMATION	SHIPPING INFORMATION	VOLUME/CONTAINER TYPE/ PRESERVATIVE
Name: [illegible]	Project Name: [illegible]	Carrier: Fed Ex	
Address: [illegible]	[illegible]		
City/State/Zip: [illegible]	Project Number: [illegible]	Airbill Number: [illegible]	
Telephone: [illegible]	Sampler Name(s): [illegible]	Date Shipped: [illegible]	
Facsimile:			
Contact Name: [illegible]	Quote #: Client Code:	Hand Delivered: ☐ Yes ☐ No	

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS	NUMBER OF CONTAINERS					
SD-23	10/6/11	1330	X			[illegible]	X					
SD-24	10/6/11	1350	X			[illegible]	X					
SD-19	10/7/11	1045	X				X					
SD-15	10/7/11	1400	X				X					

Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
[signature]	10/7/11	1830	
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)

NOTES TO SAMPLER(S):

NOTES TO LAB: CO5[illegible] 9.22

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

Aquatec Biological Sciences
Chain-of-Custody-Record

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FAX: (802) 658-3189

COMPANY INFORMATION	COMPANY'S PROJECT INFORMATION	SHIPPING INFORMATION	VOLUME/CONTAINER TYPE/ PRESERVATIVE
Name: TRC	Project Name: SMC 002 Supplemental RI	Carrier: Fed Ex	1/2 gal / Plastic Bucket / ICE
Address: 1500 Market St.	Project Number: 112434.00002.00311	Airbill Number: [redacted]	
City/State/Zip: Philadelphia PA 19602	Sampler Name(s): C. Carlson, D. Danehey + L Ransen	Date Shipped: 10/14/11	
Telephone: (508) 320-2678			
Facsimile:			
Contact Name: Scott Ham	Quote #: Client Code:	Hand Delivered: ☐ Yes ☒ No	

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS	NUMBER OF CONTAINERS					
SD-31	10/10/11	1330	X			Aquatic Toxicity EPA/600/R99	1					
SD-35A	10/11/11	0945	X			1064 Method 100.4	1					
SD-13	10/12/11	0800	X			↓	1					
SD-10	10/12/11	1345	X			↓	1					

Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
[signature]	10/14/11	1400	
Relinquished by: (signature)	10/15/11	10:00	[signature]
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)

NOTES TO SAMPLER(S): Cooler Temps 0°C

NOTES TO LAB: 2 Coolers

0°C

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

R2-0001686

Page 1 of 1

Aquatec Biological Sciences

Chain-of-Custody-Record

COMPANY INFORMATION	COMPANY'S PROJECT INFORMATION	SHIPPING INFORMATION	VOLUME/CONTAINER TYPE/ PRESERVATIVE
Name: [illegible]	Project Name: [illegible]	Carrier: Fed Ex	
Address: [illegible]	Project Number: [illegible]	Airbill Number: ~~9278 9156 2352~~ 9278 9156 2341	
City/State/Zip: [illegible]	Sampler Name(s): [illegible]	Date Shipped: [illegible]	
Telephone: [illegible]			
Facsimile:			
Contact Name: [illegible]	Quote #: Client Code:	Hand Delivered: ☐ Yes ☒ No	

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS	NUMBER OF CONTAINERS
SD-31	[illegible]	1330	X			Aquatic Toxicity [illegible]	1
SD-35A	[illegible]	[illegible]	X			[illegible] 100-d	1
SD-13	[illegible]	[illegible]	X			↓	1
SD-10	[illegible]	1345	X				1

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
[signature]	[illegible]	[illegible]	
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Relinquished by: (signature)	DATE	TIME	Received by: (signature)

NOTES TO SAMPLER(S): Saturday Delivery

NOTES TO LAB: 2 Coolers

R2-0001687

Page ______ of ______

Aquatec Biological Sciences

Chain-of-Custody-Record

273 Commerce Street
Williston, VT 05495
TEL: (802) 860-1638
FAX: (802) 658-3189

COMPANY INFORMATION	COMPANY'S PROJECT INFORMATION	SHIPPING INFORMATION	VOLUME/CONTAINER TYPE/ PRESERVATIVE
Name:	Project Name:	Carrier:	HDPE Bucket
Address	Project Number:	Airbill Number:	
City/State/Zip:	Sampler Name(s):	Date Shipped:	
Telephone:		Hand Delivered: ☐ Yes ☐ No	
Facsimile:	Quote #: Client Code:		
Contact Name:			

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS	NUMBER OF CONTAINERS
Lake Arrowhead	10/9/11	08:00	X		Sediment	TO mix with	2-3 L
Georgia, VT.						Lamoille River	
						Sediment (collected 10/6/11	
20						Fine sediments	
						Control Sed	
						0.5-mm Sieved	
						in field.	

Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
	10/9/11	08:45	
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)

NOTES TO SAMPLER(S): AT Aquatec.

NOTES TO LAB:

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

R2-0001688

Aquatec Biological Sciences

Chain-of-Custody-Record

273 Commerce Street
Williston, VT 05495
TEL: (802) 860-1638
FAX: (802) 658-3189

COMPANY INFORMATION	COMPANY'S PROJECT INFORMATION	SHIPPING INFORMATION	VOLUME/CONTAINER TYPE/ PRESERVATIVE
Name:	Project Name:	Carrier:	CARBOYS
Address		Airbill Number:	HDPE
City/State/Zip:	Project Number:	Date Shipped:	50 L
Telephone:	Sampler Name(s): JW + JG	Hand Delivered: ☒ Yes ☐ No	
Facsimile:	Quote #: Client Code:		
Contact Name:			

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS	NUMBER OF CONTAINERS
Lake Champlain water	10/21/11	14:30	X		WATER	Hyalella azteca lake mix for overlying water 5-10 um filtration during collection.	6

21

Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
	10/21/11	15:00	
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)

NOTES TO SAMPLER(S): at Aquatec

NOTES TO LAB:

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

R2-0001689

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Aquatec Biological Sciences

Chain-of-Custody-Record

273 Commerce Street
Williston, VT 05495
TEL: (802) 860-1638
FAX: (802) 658-3189

COMPANY INFORMATION

Name: ____________
Address ____________
City/State/Zip: ____________
Telephone: ____________
Facsimile: ____________
Contact Name: ____________

COMPANY'S PROJECT INFORMATION

Project Name: ____________
Project Number: ____________
Sampler Name(s): JG + KK
Quote #: ______ Client Code: ______

SHIPPING INFORMATION

Carrier: ____________
Airbill Number: ____________
Date Shipped: ____________
Hand Delivered: ☒ Yes ☐ No

VOLUME/CONTAINER TYPE/ PRESERVATIVE

50L / HDPE / Carboy

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS	NUMBER OF CONTAINERS					
Lake Champlain Water	11-8-11	1500	X		water	For H. azteca	6					
						Lake mix (overlying)						
						water.						
22						Filtered 5-10µm						
						during collection						

Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
J Garrison	11-8-11	1550	J. Garrison (at Aquatec)
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)

NOTES TO SAMPLER(S):

NOTES TO LAB: ____________

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

Page ______ of _____

Aquatec Biological Sciences

Chain-of-Custody-Record

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FAX: (802) 658-3189

COMPANY INFORMATION	COMPANY'S PROJECT INFORMATION	SHIPPING INFORMATION	VOLUME/CONTAINER TYPE/ PRESERVATIVE
Name:	Project Name:	Carrier: John William	HDPE
Address	Project Number:	Airbill Number:	50 L
City/State/Zip:	Sampler Name(s): John Williams, Kaitlyn Koch	Date Shipped:	CARBOYS
Telephone:		Hand Delivered: ☒ Yes ☐ No	
Facsimile:			
Contact Name:	Quote #: Client Code:		

SAMPLE IDENTIFICATION	COLLECTION DATE	COLLECTION TIME	GRAB	COMPOSITE	MATRIX	ANALYSIS/REMARKS	NUMBER OF CONTAINERS					
Lake Champlain Water	11/22/11	10:30	X		water	Prepare Lake Mix for Hyalella azteca overlying water. Filtered in field	5					
23												

Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
	11/22/11	11:15	
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)
Relinquished by: (signature)	DATE	TIME	Recieved by: (signature)

NOTES TO SAMPLER(S): Aquatec.

NOTES TO LAB:

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

R2-0001691

Toxicity Test Methods

TRC SMC 002 Supplemental ***Project:*** ***11050***

1	Test type:	Whole-sediment toxicity test with renewal of overlying water
2	Temperature:	23 +/- 1C
3	Light quality:	Wide-spectrum fluorescent lights
4	Illuminance:	About 100 to 1000lux
5	Photoperiod:	16L:8D
6	Test chamber:	300mL high-form lipless beaker
7	Sediment volume:	100mL
8	Overlying water volume:	175mL
9	Renewal of overlying water:	2 volume additions/day; continuous or intermittent (e.g. 1 volume addition every 12h)
10	Age of organisms:	7 to 8 day old at the start of the test
11	No. of organisms/chamber:	10
12	No. of replicate chambers/treatment:	8
13	Feeding:	YCT food, fed 1.0mL daily
14	Aeration:	None, unless dissolved oxygen in overlying water drops below 2.5mg/L
15	Overlying water:	Lake Mix
16	Test chamber cleaning:	If screens become clogged during a test, gently brush the outside of the screen
17	Overlying water quality:	Hardness, alkalinity, conductivity, pH, and ammonia at the beginning and end of sediment exposure (Day 0 and 27 or 28). Temperature daily. Conductivity weekly. Dissolved oxygen (DO) and pH three times/week. Concentrations of DO should be measured more often if DO drops more than 1 mg/L since the previous measurement.
18	Test duration:	42 days
19	Endpoints:	28 day survival; 35 day survival and reproduction; and 42 day survival, growth, reproduction, and number of adult males and females on day 42
20	Test acceptability:	Minimum mean control survival of 80% on Day 28.

Method: **100.4-28Ha** ***Amphipod, H. azteca, 28-D Survival and Growth Test***

Hyalella azteca Associated Protocol: EPA/600/R-99/064 **SOP:** TOX3-016

TRC SMC 002 Supplemental ***Project*** ***11050***

1	Test type:	Whole-sediment toxicity test with renewal of overlying water
2	Temperature:	23 +/- 1C
3	Light quality:	Wide-spectrum fluorescent lights
4	Illuminance:	About 100 to 1000lux
5	Photoperiod:	16L:8D
6	Test chamber:	300mL high-form lipless beaker
7	Sediment volume:	100mL
8	Overlying water volume:	175mL
9	Renewal of overlying water:	2 volume additions/day (e.g. 1 volume addition every 12h)
10	Age of organisms:	7 to 8 day old at the start of the test
11	No. of organisms/chamber:	10
12	No. of replicate chambers/treatment:	8
13	Feeding:	YCT food, fed 1.0mL daily (1800mg/L stock) to each test chamber.
14	Aeration:	None, unless dissolved oxygen in overlying water drops below 2.5mg/L
15	Overlying water:	Lake Mix
16	Test chamber cleaning:	If screens become clogged during a test, gently brush the outside of the screen
17	Overlying water quality:	Hardness, alkalinity, conductivity, pH, and ammonia at the beginning and end of sediment exposure (Day 0 and 27 or 28). Temperature daily. Conductivity weekly. Dissolved oxygen (DO) and pH three times/week. Concentrations of DO should be measured more often if DO drops more than 1 mg/L since the previous measurement.
18	Test duration:	28 days
19	Endpoints:	28 day survival and growth
20	Test acceptability:	Minimum mean control survival of 80% on Day 28.

100.4 - Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Test Run No:	16-2854-4277	**Test Type:**	Hyalella (42d)	**Analyst:**	
Start Date:	20 Oct-11 16:15	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Reconstituted Water
Ending Date:	01 Dec-11 13:30	**Species:**	Hyalella azteca	**Brine:**	
Duration:	41d 21h	**Source:**	Aquatic Research Organisms, NH	**Age:**	

Sample Code	Sample No	Sample Date	Receive Date	Sample Age	Client Name	Project
41686	15-3168-3101	19 Oct-11	19 Oct-11	40h	TRC-2	
41687	10-2505-5517	06 Oct-11 13:30	08 Oct-11 09:45	14d 3h		
41688	15-8687-1003	06 Oct-11 17:50	08 Oct-11 09:45	13d 22h		
41689	20-0642-3130	07 Oct-11 10:45	08 Oct-11 09:45	13d 6h		
41690	00-4102-0288	07 Oct-11 14:00	08 Oct-11 09:45	13d 2h		
41739	18-5874-1769	10 Oct-11 13:30	15 Oct-11 10:00	10d 3h		
41740	03-9904-2725	11 Oct-11 09:45	15 Oct-11 10:00	9d 7h		
41741	12-3233-4825	12 Oct-11 08:00	15 Oct-11	8d 8h		
41742	11-5784-0090	12 Oct-11 13:45	15 Oct-11 10:00	8d 3h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
41686	Control Sediment	CONTROL	CONTROL		
41687	Sediment	SMC 002 Supplemental	SD-23		
41688	Sediment	SMC 002 Supplemental	SD-04		
41689	Sediment	SMC 002 Supplemental	SD-18		
41690	Sediment	SMC 002 Supplemental	SD-15		
41739	Sediment	SMC 002 Supplemental	SD-31		
41740	Sediment	SMC 002 Supplemental	SD-35A		
41741	Sediment	SMC 002 Supplemental	SD-13		
41742	Sediment	SMC 002 Supplemental	SD-10		

Test Acceptability

Analysis No	Endpoint	Attribute	Test Stat	Acceptabilty Limits	Overlap	Decision
01-1862-4539	28d Survival Rate	Control Resp	0.913	0.8 - NL	Yes	Passes acceptability criteria
05-8772-8507	28d Survival Rate	Control Resp	0.913	0.8 - NL	Yes	Passes acceptability criteria
08-6431-0101	28d Survival Rate	Control Resp	0.913	0.8 - NL	Yes	Passes acceptability criteria
08-9137-5774	28d Survival Rate	Control Resp	0.913	0.8 - NL	Yes	Passes acceptability criteria
12-8770-6811	28d Survival Rate	Control Resp	0.913	0.8 - NL	Yes	Passes acceptability criteria
18-5360-0747	28d Survival Rate	Control Resp	0.913	0.8 - NL	Yes	Passes acceptability criteria
19-2739-0458	28d Survival Rate	Control Resp	0.913	0.8 - NL	Yes	Passes acceptability criteria
20-2806-8001	28d Survival Rate	Control Resp	0.913	0.8 - NL	Yes	Passes acceptability criteria

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.862	0.963	0.6	1	0.0248	0.136	14.9%	0.0%
41687	8	0.963	0.943	0.982	0.9	1	0.00945	0.0518	5.38%	-5.48%
41688	8	0.988	0.974	1	0.9	1	0.00645	0.0354	3.58%	-8.22%
41689	8	0.025	0.00771	0.0423	0	0.1	0.00845	0.0463	185.0%	97.3%
41690	8	0.888	0.85	0.925	0.7	1	0.0181	0.0991	11.2%	2.74%
41739	8	0.963	0.943	0.982	0.9	1	0.00945	0.0518	5.38%	-5.48%
41740	8	0.963	0.943	0.982	0.9	1	0.00945	0.0518	5.38%	-5.48%
41741	8	1	1	1	1	1	0	0	0.0%	-9.59%
41742	8	0.875	0.827	0.923	0.6	1	0.0234	0.128	14.6%	4.11%

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.862	0.963	0.6	1	0.0248	0.136	14.9%	0.0%
41687	8	0.963	0.943	0.982	0.9	1	0.00945	0.0518	5.38%	-5.48%
41688	8	0.988	0.974	1	0.9	1	0.00645	0.0354	3.58%	-8.22%
41689	8	0.025	0.00771	0.0423	0	0.1	0.00845	0.0463	185.0%	97.3%
41690	8	0.875	0.836	0.914	0.7	1	0.0189	0.104	11.8%	4.11%
41739	8	0.963	0.943	0.982	0.9	1	0.00945	0.0518	5.38%	-5.48%
41740	8	0.938	0.918	0.957	0.9	1	0.00945	0.0518	5.52%	-2.74%
41741	8	0.975	0.958	0.992	0.9	1	0.00845	0.0463	4.75%	-6.85%
41742	8	0.85	0.805	0.895	0.6	1	0.0218	0.12	14.1%	6.85%

42d Mean Dry Weight Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00653	0.0358	10.9%	0.0%
41687	8	0.368	0.349	0.386	0.298	0.447	0.00908	0.0497	13.5%	-11.6%
41688	8	0.328	0.318	0.338	0.287	0.365	0.00501	0.0274	8.37%	0.48%
41689	1	0.4			0.4	0.4	0	0	0.0%	-21.4%
41690	8	0.372	0.353	0.391	0.296	0.443	0.00911	0.0499	13.4%	-13.0%
41739	8	0.33	0.32	0.34	0.302	0.385	0.00477	0.0262	7.93%	-0.15%
41740	8	0.351	0.343	0.36	0.319	0.376	0.00411	0.0225	6.41%	-6.62%
41741	8	0.359	0.341	0.376	0.287	0.42	0.00847	0.0464	12.9%	-8.9%
41742	8	0.346	0.33	0.361	0.298	0.422	0.00751	0.0411	11.9%	-4.92%

42d Reproduction Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.06	2.25	5	0.18	0.984	26.7%	0.0%
41687	8	4.37	3.62	5.12	1.4	7	0.366	2	45.8%	-18.4%
41688	8	2.62	2.31	2.94	1.33	3.6	0.154	0.841	32.1%	28.9%
41689	1	0			0	0	0	0		100.0%
41690	8	3.64	2.9	4.38	1.4	7	0.364	1.99	54.7%	1.42%
41739	8	3.17	2.67	3.68	2	5.33	0.246	1.35	42.5%	14.1%
41740	8	5.11	3.58	6.64	2.33	15	0.748	4.1	80.1%	-38.5%
41741	8	3.37	3.03	3.7	1.8	4.43	0.163	0.894	26.6%	8.82%
41742	8	2.85	2.14	3.57	1	7	0.349	1.91	67.1%	22.7%

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0213	0.116	13.3%	0.0%
41687	8	0.95	0.922	0.978	0.8	1	0.0138	0.0756	7.96%	-8.57%
41688	8	0.964	0.945	0.982	0.9	1	0.00918	0.0503	5.22%	-10.1%
41689	8	0.0125	0	0.0257	0	0.1	0.00645	0.0354	283.0%	98.6%
41690	8	0.838	0.793	0.882	0.7	1	0.0217	0.119	14.2%	4.29%
41739	8	0.913	0.881	0.944	0.8	1	0.0152	0.0835	9.15%	-4.29%
41740	8	0.813	0.758	0.867	0.5	1	0.0266	0.146	17.9%	7.14%
41741	8	0.963	0.943	0.982	0.9	1	0.00945	0.0518	5.38%	-10.0%
41742	8	0.838	0.781	0.894	0.5	1	0.0275	0.151	18.0%	4.29%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.9	1	1	1	1	0.9	0.6	0.9
41687	1	1	1	0.9	0.9	1	1	0.9
41688	1	1	1	1	1	0.9	1	1
41689	0	0	0	0	0.1	0	0	0.1
41690	0.7	1	0.9	0.8	0.9	0.9	1	0.9
41739	1	1	0.9	1	1	0.9	0.9	1
41740	1	0.9	1	0.9	1	0.9	1	1
41741	1	1	1	1	1	1	1	1
41742	0.9	0.9	1	0.9	1	0.6	0.9	0.8

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.9	1	1	1	1	0.9	0.6	0.9
41687	1	1	1	0.9	0.9	1	1	0.9
41688	1	1	1	1	1	0.9	1	1
41689	0	0	0	0	0.1	0	0	0.1
41690	0.7	1	0.8	0.8	0.9	0.9	1	0.9
41739	1	1	0.9	1	1	0.9	0.9	1
41740	1	0.9	1	0.9	0.9	0.9	0.9	1
41741	1	0.9	1	1	1	1	0.9	1
41742	0.8	0.9	0.9	0.9	1	0.6	0.9	0.8

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.274	0.319	0.31	0.311	0.346	0.378	0.319
41687	0.349	0.361	0.332	0.447	0.386	0.298	0.341	0.427
41688	0.315	0.33	0.299	0.322	0.351	0.353	0.287	0.365
41689	0.4							
41690	0.424	0.324	0.38	0.443	0.367	0.399	0.296	0.343
41739	0.313	0.332	0.332	0.308	0.324	0.342	0.385	0.302
41740	0.357	0.376	0.337	0.369	0.366	0.365	0.319	0.321
41741	0.328	0.401	0.333	0.287	0.327	0.42	0.397	0.377
41742	0.364	0.353	0.301	0.357	0.298	0.422	0.312	0.357

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	3.5	3	4.8	2.25	3.75	4.4	5	2.83
41687	2.75	5.57	1.4	5.75	4.83	2.17	5.5	7
41688	3.4	3	1.33	3.17	2.75	2.14	1.6	3.6
41689					0			
41690	1.5	6	7	3.67	1.4	2.71	3.83	3
41739	3	2.2	2	2.86	2.4	5.25	5.33	2.33
41740	2.75	2.33	3.6	4	15	5.4	4	3.83
41741	4.2	3.5	1.8	4.43	2.5	3	4	3.5
41742	1	4	2.57	2.67	1.25	7	2.33	2

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.9	0.9	0.9	0.9	1	0.9	0.6	0.9
41687	1	1	1	0.9	0.8	1	1	0.9
41688	1	0.9	1	0.909	1	0.9	1	1
41689	0	0	0	0	0.1	0	0	0
41690	0.7	0.9	0.7	0.7	0.9	0.9	1	0.9
41739	1	1	0.9	0.9	0.9	0.8	0.8	1
41740	0.9	0.8	1	0.8	0.5	0.8	0.8	0.9
41741	1	0.9	1	1	1	1	0.9	0.9
41742	0.8	0.9	0.9	0.9	1	0.5	0.9	0.8

CETIS Analytical Report

Report Date: 04 Dec-11 09:43 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 05-8772-8507 **Endpoint:** 28d Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:40 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.79%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41687	73.5		2	0.8460	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0172882	0.0172882	1	0.873	0.3660	Non-Significant Effect
Error	0.2773485	0.0198106	14			
Total	0.2946367	0.0370988	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.57	8.89	0.0629	Equal Variances
Distribution	Shapiro-Wilk Normality	0.806		0.0033	Non-normal Distribution

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41687	8	0.963	0.943	0.982	0.9	1	0.00961	0.0518	5.38%	-5.48%

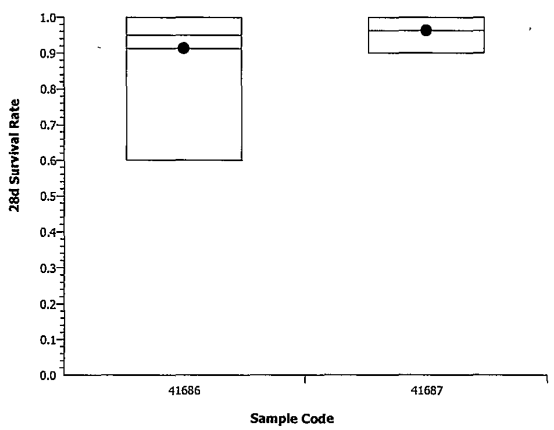
Angular (Corrected) Transformed Summary

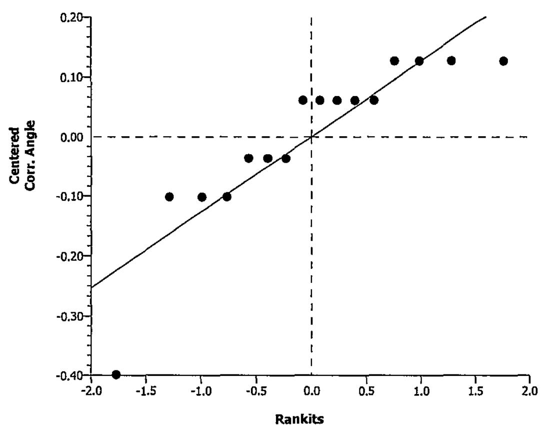
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41687	8	1.35	1.32	1.38	1.25	1.41	0.0157	0.0843	6.24%	-5.12%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41687	1	1	1	1	1	0.9	0.9	0.9

Graphics





Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 20-2806-8001 **Endpoint:** 28d Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:40 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.31%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41688	80.5		2	0.9870	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0461527	0.0461527	1	2.57	0.1310	Non-Significant Effect
Error	0.2511411	0.0179387	14			
Total	0.2972938	0.0640914	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	9.65	8.89	0.0078	Unequal Variances
Distribution	Shapiro-Wilk Normality	0.759		0.0008	Non-normal Distribution

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41688	8	0.988	0.974	1	0.9	1	0.00657	0.0354	3.58%	-8.22%

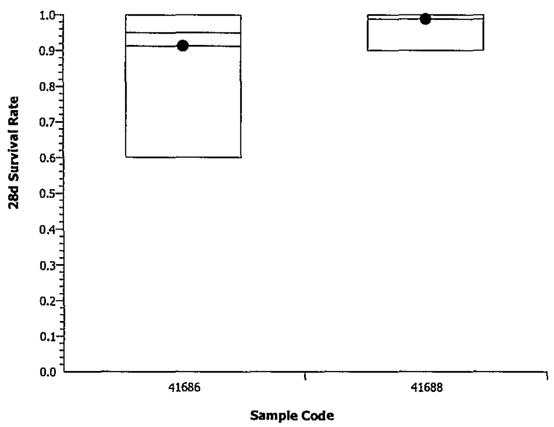
Angular (Corrected) Transformed Summary

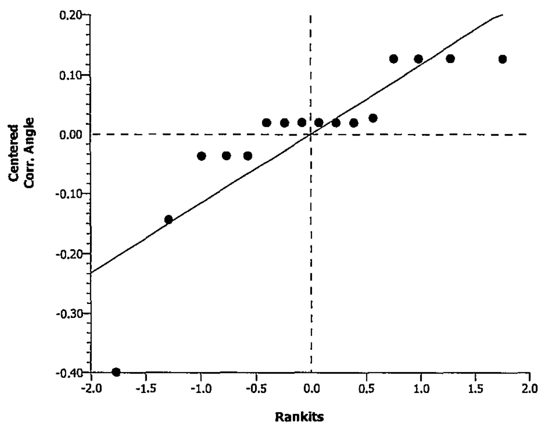
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41688	8	1.39	1.37	1.41	1.25	1.42	0.0108	0.0581	4.17%	-8.36%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41688	1	1	1	1	1	1	1	0.9

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:43 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	18-5360-0747	**Endpoint:**	28d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:40	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.61%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41689	36		0	0.0001	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	4.714431	4.714431	1	247	0.0000	Significant Effect
Error	0.2673887	0.0190992	14			
Total	4.98182	4.733531	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	5.71	8.89	0.0350	Equal Variances
Distribution	Shapiro-Wilk Normality	0.711		0.0002	Non-normal Distribution

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41689	8	0.025	0.00739	0.0426	0	0.1	0.0086	0.0463	185.0%	97.3%

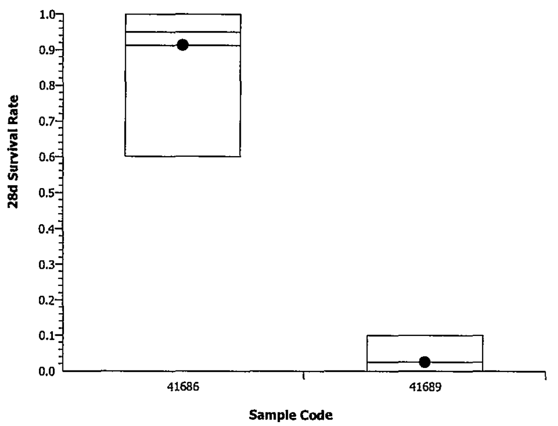
Angular (Corrected) Transformed Summary

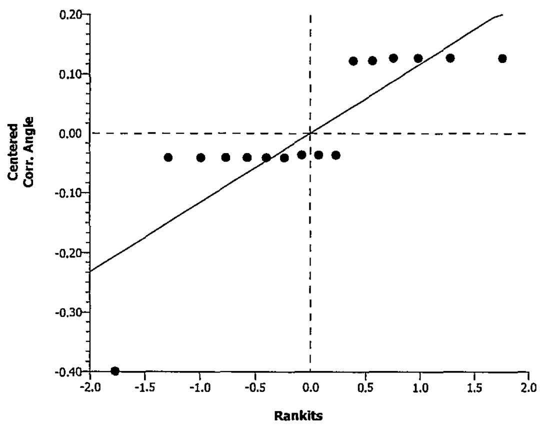
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41689	8	0.2	0.171	0.228	0.159	0.322	0.014	0.0754	37.8%	84.5%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41689	0.1	0.1	0	0	0	0	0	0

Graphics





R2-0001702

CETIS Analytical Report

Report Date:	04 Dec-11 09:43 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	01-1862-4539	**Endpoint:**	28d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:40	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					9.3%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41690	0.56	1.76	0.143	0.2920	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0082246	0.0082246	1	0.314	0.5840	Non-Significant Effect
Error	0.3666284	0.0261877	14			
Total	0.374853	0.0344123	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.64	8.89	0.5320	Equal Variances
Distribution	Shapiro-Wilk Normality	0.869		0.0260	Normal Distribution

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41690	8	0.888	0.85	0.925	0.7	1	0.0184	0.0991	11.2%	2.74%

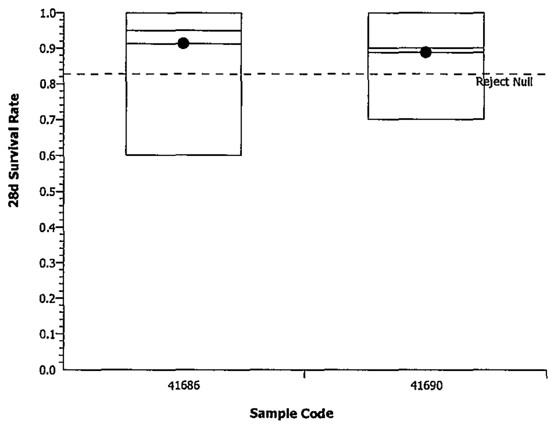
Angular (Corrected) Transformed Summary

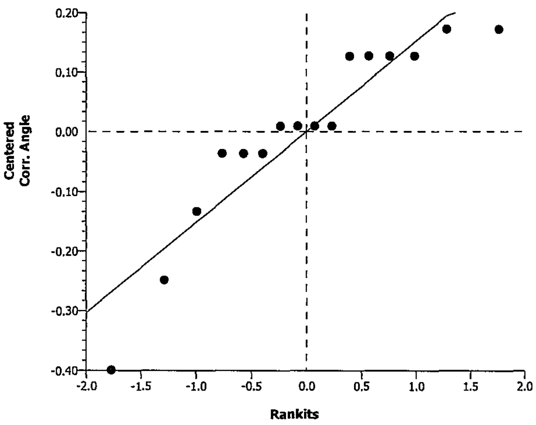
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41690	8	1.24	1.19	1.29	0.991	1.41	0.0262	0.141	11.4%	3.53%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41690	1	1	0.9	0.9	0.9	0.9	0.8	0.7

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:43 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	08-6431-0101	**Endpoint:**	28d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:40	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.79%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41739	73.5		2	0.8390	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0172882	0.0172882	1	0.873	0.3660	Non-Significant Effect
Error	0.2773485	0.0198106	14			
Total	0.2946367	0.0370988	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.57	8.89	0.0629	Equal Variances
Distribution	Shapiro-Wilk Normality	0.806		0.0033	Non-normal Distribution

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41739	8	0.963	0.943	0.982	0.9	1	0.00961	0.0518	5.38%	-5.48%

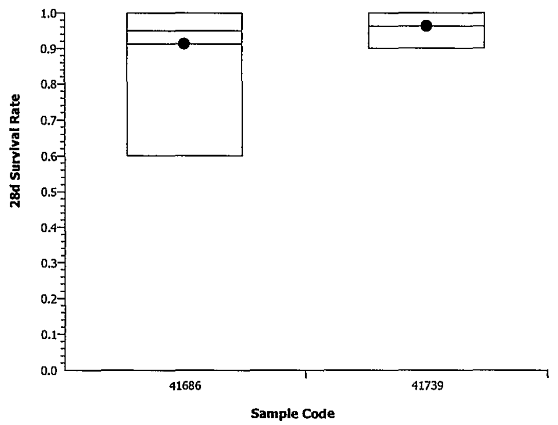
Angular (Corrected) Transformed Summary

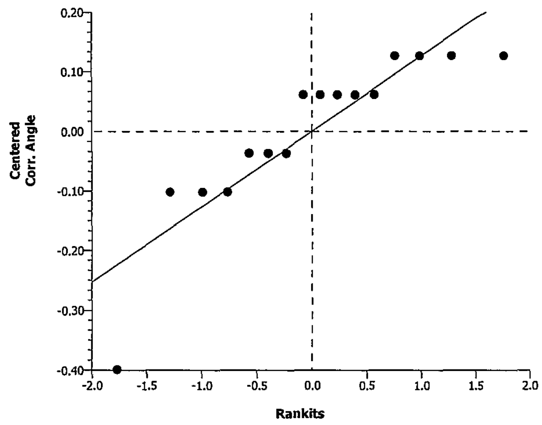
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41739	8	1.35	1.32	1.38	1.25	1.41	0.0157	0.0843	6.24%	-5.12%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41739	1	1	1	1	1	0.9	0.9	0.9

Graphics





Analyst:________ QA:________ 12/15/11

R2-0001704

CETIS Analytical Report

Report Date:	04 Dec-11 09:43 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	19-2739-0458	**Endpoint:**	28d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:40	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.79%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41740	73.5		2	0.8410	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0172882	0.0172882	1	0.873	0.3660	Non-Significant Effect
Error	0.2773485	0.0198106	14			
Total	0.2946367	0.0370988	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.57	8.89	0.0629	Equal Variances
Distribution	Shapiro-Wilk Normality	0.806		0.0033	Non-normal Distribution

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41740	8	0.963	0.943	0.982	0.9	1	0.00961	0.0518	5.38%	-5.48%

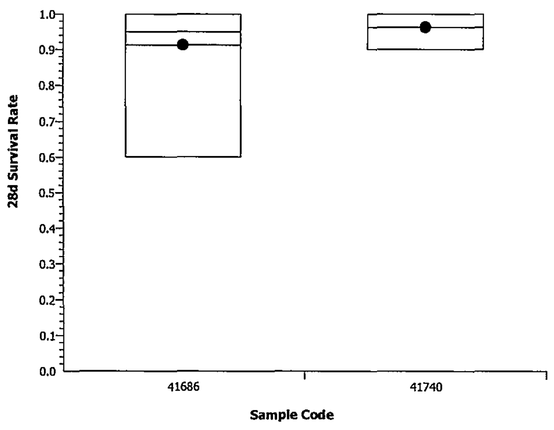
Angular (Corrected) Transformed Summary

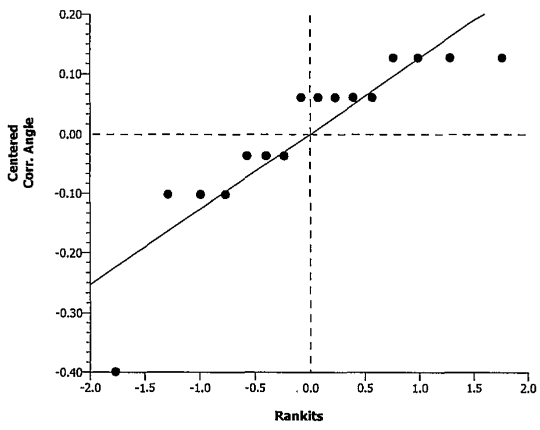
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41740	8	1.35	1.32	1.38	1.25	1.41	0.0157	0.0843	6.24%	-5.12%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41740	1	1	1	1	1	0.9	0.9	0.9

Graphics





Analyst:________ QA: 12/15/11

R2-0001705

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	12-8770-6811	**Endpoint:**	28d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:40	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					6.87%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41741	84		1	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0643700	0.0643700	1	3.96	0.0665	Non-Significant Effect
Error	0.2275497	0.0162536	14			
Total	0.2919198	0.0806236	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.28E+14	8.89	0.0000	Unequal Variances
Distribution	Shapiro-Wilk Normality	0.676		0.0001	Non-normal Distribution

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41741	8	1	1	1	1	1	0	0	0.0%	-9.59%

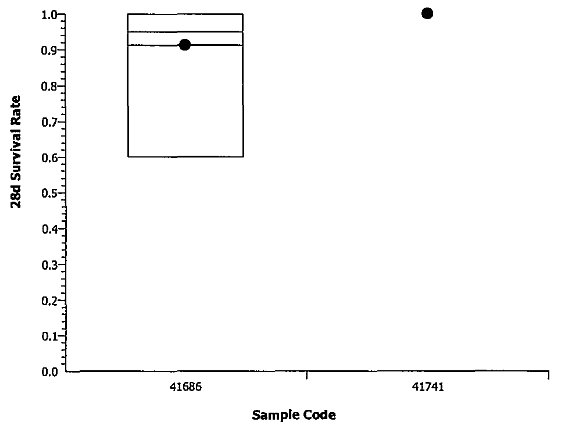
Angular (Corrected) Transformed Summary

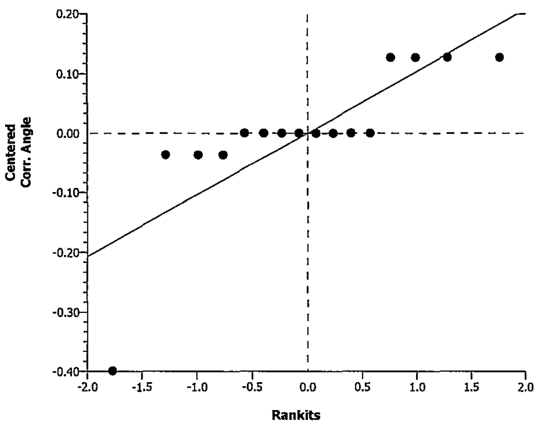
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41741	8	1.41	1.41	1.41	1.41	1.41	0	0	0.0%	-9.87%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41741	1	1	1	1	1	1	1	1

Graphics





CETIS Analytical Report

Report Date: 04 Dec-11 09:43 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 08-9137-5774 **Endpoint:** 28d Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:40 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					10.3%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41742	0.668	1.76	0.154	0.2570	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0136795	0.0136795	1	0.447	0.5150	Non-Significant Effect
Error	0.4285477	0.0306106	14			
Total	0.4422272	0.0442901	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.13	8.89	0.8740	Equal Variances
Distribution	Shapiro-Wilk Normality	0.847		0.0121	Normal Distribution

28d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41742	8	0.875	0.826	0.924	0.6	1	0.0238	0.128	14.6%	4.11%

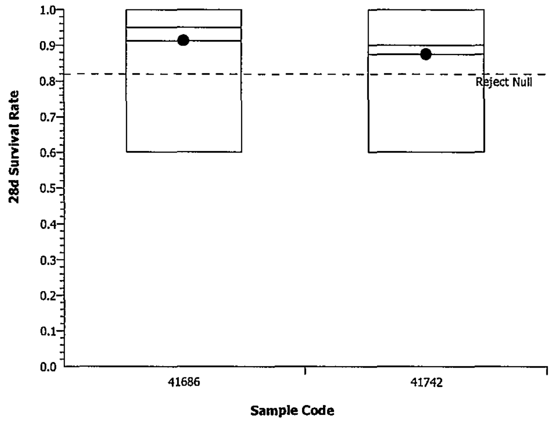
Angular (Corrected) Transformed Summary

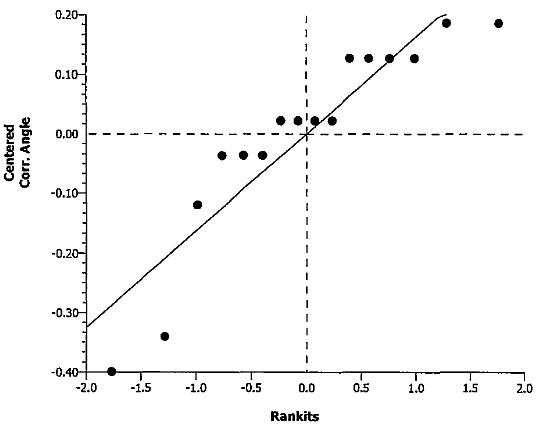
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41742	8	1.23	1.16	1.29	0.886	1.41	0.0315	0.169	13.8%	4.55%

28d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41742	1	1	0.9	0.9	0.9	0.9	0.8	0.6

Graphics





Analyst:________ QA: [signature] 12/15/11

CETIS Analytical Report

Report Date: 04 Dec-11 09:44 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 18-1875-8904 **Endpoint:** 35d Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:40 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.79%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41687	73.5		2	0.8440	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0172882	0.0172882	1	0.873	0.3660	Non-Significant Effect
Error	0.2773485	0.0198106	14			
Total	0.2946367	0.0370988	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.57	8.89	0.0629	Equal Variances
Distribution	Shapiro-Wilk Normality	0.806		0.0033	Non-normal Distribution

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41687	8	0.963	0.943	0.982	0.9	1	0.00961	0.0518	5.38%	-5.48%

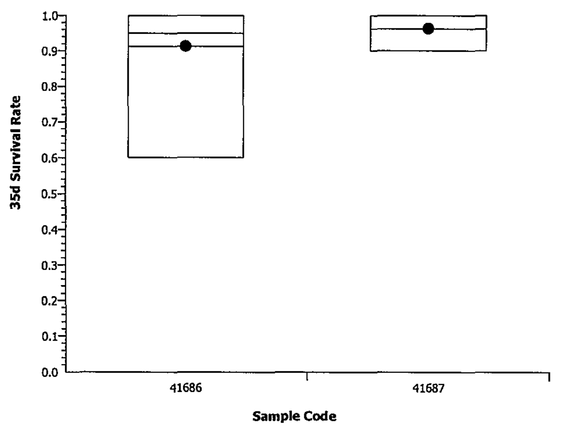
Angular (Corrected) Transformed Summary

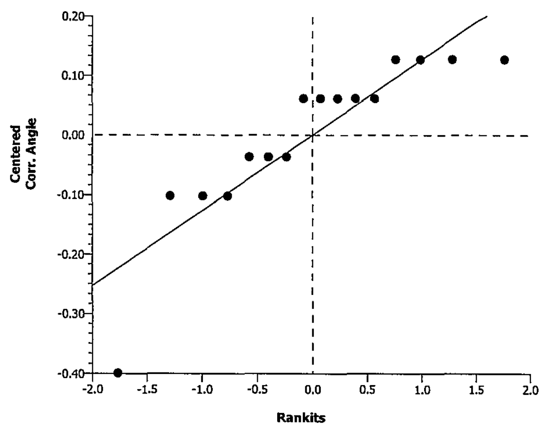
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41687	8	1.35	1.32	1.38	1.25	1.41	0.0157	0.0843	6.24%	-5.12%

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41687	1	1	1	1	1	0.9	0.9	0.9

Graphics





Analyst:________ QA:________ G 12/15/11

R2-0001708

CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	01-9132-5550	**Endpoint:**	35d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:40	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.31%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41688	80.5		2	0.9880	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0461527	0.0461527	1	2.57	0.1310	Non-Significant Effect
Error	0.2511411	0.0179387	14			
Total	0.2972938	0.0640914	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	9.65	8.89	0.0078	Unequal Variances
Distribution	Shapiro-Wilk Normality	0.759		0.0008	Non-normal Distribution

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41688	8	0.988	0.974	1	0.9	1	0.00657	0.0354	3.58%	-8.22%

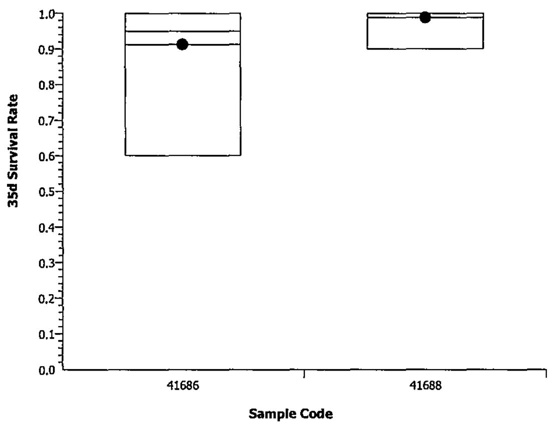
Angular (Corrected) Transformed Summary

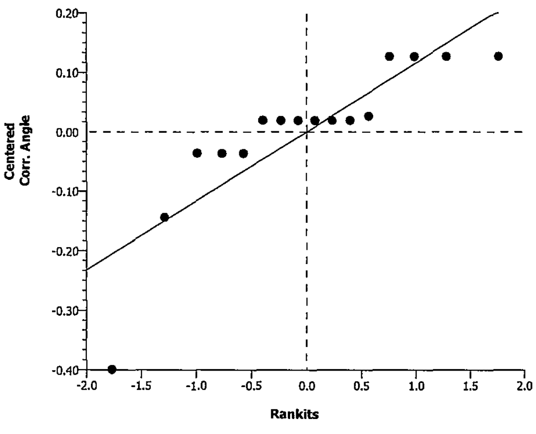
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41688	8	1.39	1.37	1.41	1.25	1.42	0.0108	0.0581	4.17%	-8.36%

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41688	1	1	1	1	1	1	1	0.9

Graphics





Analyst:________ QA: J 12/5/11

R2-0001709

CETIS Analytical Report

Report Date: 04 Dec-11 09:44 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 08-3166-8176 **Endpoint:** 35d Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:40 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.61%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41689	36		0	0.0001	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	4.714431	4.714431	1	247	0.0000	Significant Effect
Error	0.2673887	0.0190992	14			
Total	4.98182	4.733531	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	5.71	8.89	0.0350	Equal Variances
Distribution	Shapiro-Wilk Normality	0.711		0.0002	Non-normal Distribution

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41689	8	0.025	0.00739	0.0426	0	0.1	0.0086	0.0463	185.0%	97.3%

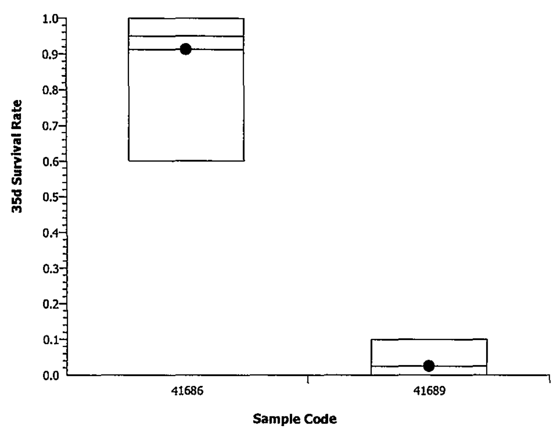
Angular (Corrected) Transformed Summary

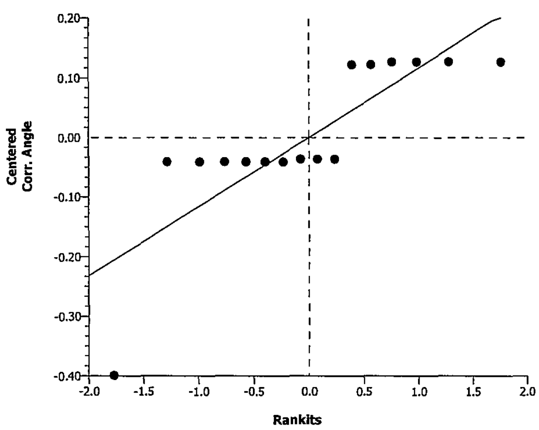
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41689	8	0.2	0.171	0.228	0.159	0.322	0.014	0.0754	37.8%	84.5%

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41689	0.1	0.1	0	0	0	0	0	0

Graphics





12/15/11

R2-0001710

CETIS Analytical Report

Report Date: 04 Dec-11 09:43 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 19-2897-0125 **Endpoint:** 35d Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:40 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					9.54%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41690	0.764	1.76	0.145	0.2290	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0159173	0.0159173	1	0.584	0.4570	Non-Significant Effect
Error	0.3816267	0.0272591	14			
Total	0.397544	0.0431764	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.48	8.89	0.6200	Equal Variances
Distribution	Shapiro-Wilk Normality	0.906		0.0990	Normal Distribution

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41690	8	0.875	0.836	0.914	0.7	1	0.0192	0.104	11.8%	4.11%

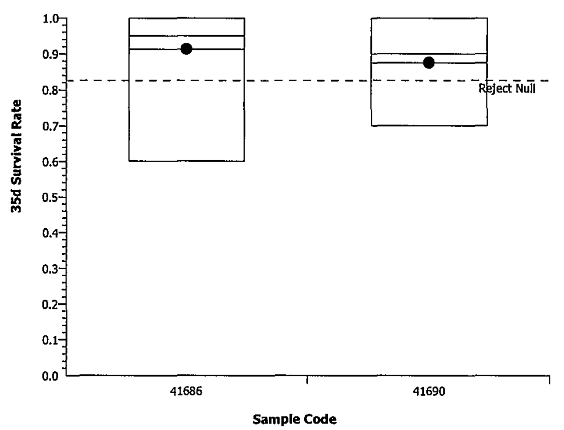
Angular (Corrected) Transformed Summary

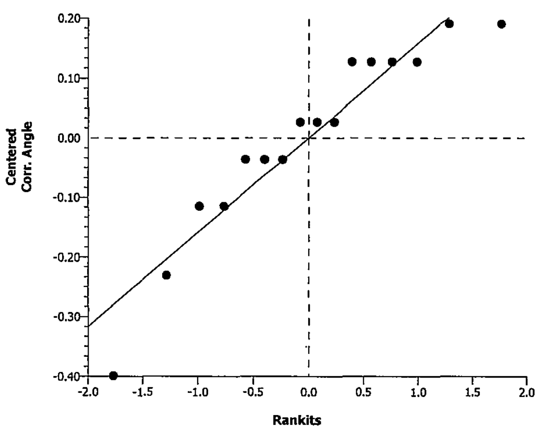
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41690	8	1.22	1.17	1.28	0.991	1.41	0.0275	0.148	12.1%	4.91%

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41690	1	1	0.9	0.9	0.9	0.8	0.8	0.7

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	01-1326-7074	**Endpoint:**	35d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:40	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.79%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41739	73.5		2	0.8450	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0172882	0.0172882	1	0.873	0.3660	Non-Significant Effect
Error	0.2773485	0.0198106	14			
Total	0.2946367	0.0370988	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.57	8.89	0.0629	Equal Variances
Distribution	Shapiro-Wilk Normality	0.806		0.0033	Non-normal Distribution

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41739	8	0.963	0.943	0.982	0.9	1	0.00961	0.0518	5.38%	-5.48%

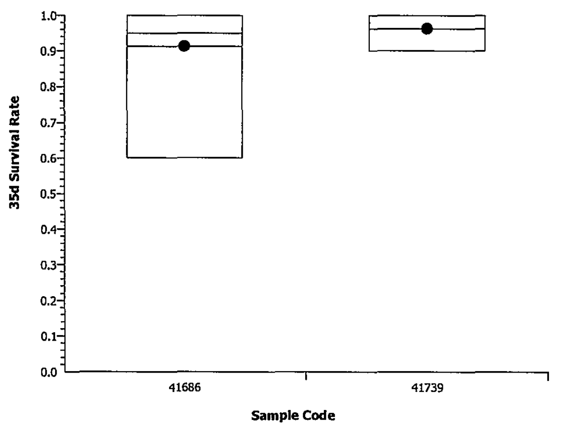
Angular (Corrected) Transformed Summary

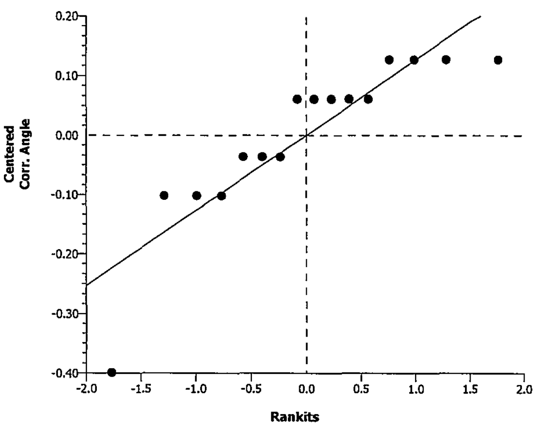
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41739	8	1.35	1.32	1.38	1.25	1.41	0.0157	0.0843	6.24%	-5.12%

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41739	1	1	1	1	1	0.9	0.9	0.9

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	02-0639-9284	**Endpoint:**	35d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:40	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.79%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41740	66.5		2	0.5050	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0025	0.0025	1	0.126	0.7280	Non-Significant Effect
Error	0.2773485	0.0198106	14			
Total	0.2798485	0.0223106	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.57	8.89	0.0629	Equal Variances
Distribution	Shapiro-Wilk Normality	0.762		0.0009	Non-normal Distribution

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41740	8	0.938	0.918	0.957	0.9	1	0.00961	0.0518	5.52%	-2.74%

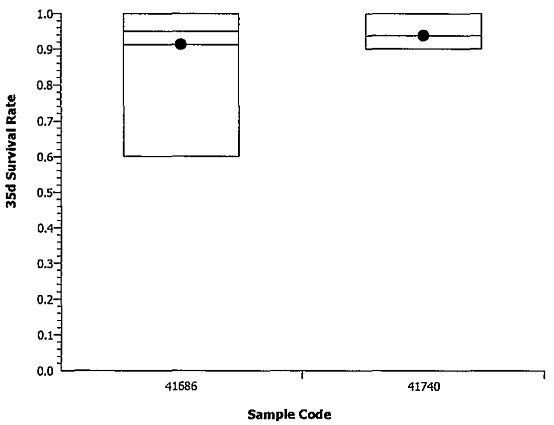
Angular (Corrected) Transformed Summary

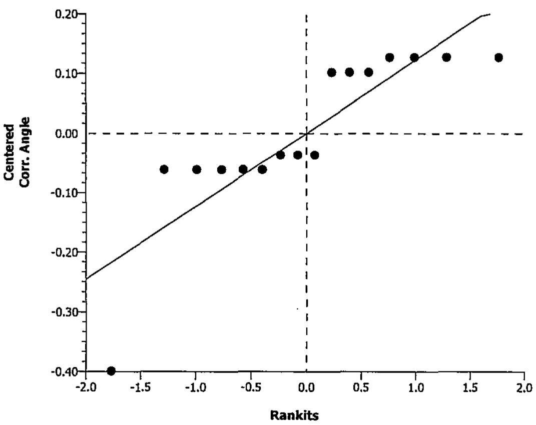
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41740	8	1.31	1.28	1.34	1.25	1.41	0.0157	0.0843	6.44%	-1.95%

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41740	1	1	1	0.9	0.9	0.9	0.9	0.9

Graphics





CETIS Analytical Report

Report Date: 04 Dec-11 09:44 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	17-8149-1241	**Endpoint:**	35d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.61%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41741	77		2	0.9390	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0296623	0.0296623	1	1.55	0.2330	Non-Significant Effect
Error	0.2673887	0.0190992	14			
Total	0.297051	0.0487615	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	5.71	8.89	0.0350	Equal Variances
Distribution	Shapiro-Wilk Normality	0.795		0.0023	Non-normal Distribution

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41741	8	0.975	0.957	0.993	0.9	1	0.0086	0.0463	4.75%	-6.85%

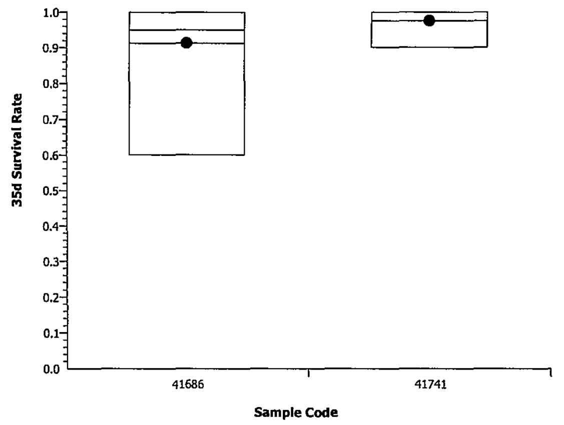
Angular (Corrected) Transformed Summary

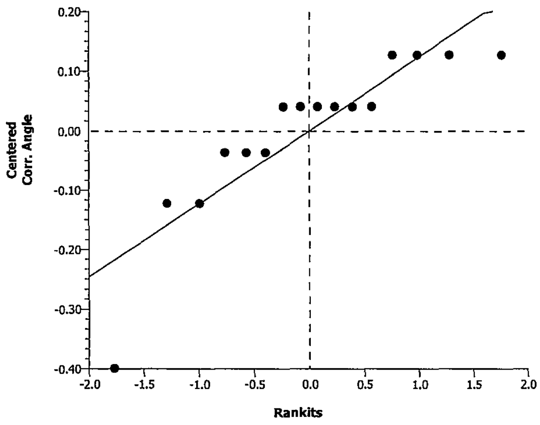
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41741	8	1.37	1.34	1.4	1.25	1.41	0.014	0.0754	5.5%	-6.7%

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41741	1	1	1	1	1	1	0.9	0.9

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	17-4389-5520	**Endpoint:**	35d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					9.78%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41742	1.15	1.76	0.148	0.1350	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0373171	0.0373171	1	1.32	0.2700	Non-Significant Effect
Error	0.396868	0.0283477	14			
Total	0.4341851	0.0656648	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.34	8.89	0.7060	Equal Variances
Distribution	Shapiro-Wilk Normality	0.871		0.0284	Normal Distribution

35d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.913	0.861	0.964	0.6	1	0.0252	0.136	14.9%	0.0%
41742	8	0.85	0.805	0.895	0.6	1	0.0222	0.12	14.1%	6.85%

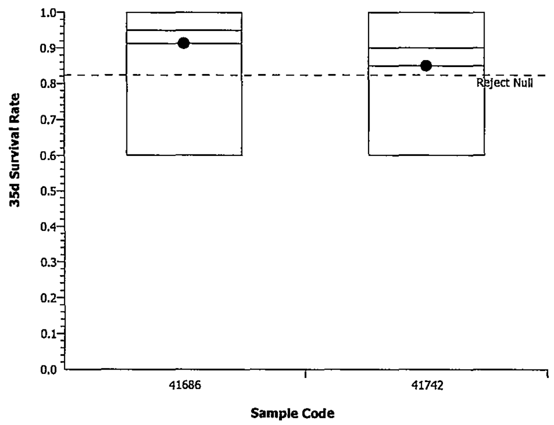
Angular (Corrected) Transformed Summary

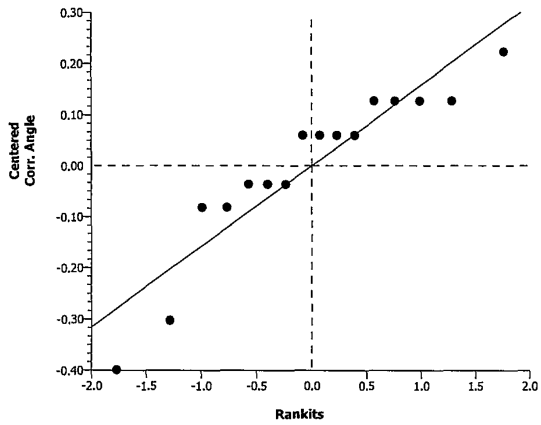
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.29	1.22	1.35	0.886	1.41	0.0335	0.18	14.0%	0.0%
41742	8	1.19	1.13	1.25	0.886	1.41	0.0289	0.156	13.1%	7.52%

35d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	1	1	1	0.9	0.9	0.9	0.6
41742	1	0.9	0.9	0.9	0.9	0.8	0.8	0.6

Graphics





12/15/11

CETIS Analytical Report

Report Date:	04 Dec-11 09:45 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	00-5714-1696	**Endpoint:**	42d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					8.64%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41687	82.5		2	0.9720	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0476279	0.0476279	1	2.67	0.1240	Non-Significant Effect
Error	0.2496286	0.0178306	14			
Total	0.2972565	0.0654585	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.59	8.89	0.5550	Equal Variances
Distribution	Shapiro-Wilk Normality	0.819		0.0049	Non-normal Distribution

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0216	0.116	13.3%	0.0%
41687	8	0.95	0.921	0.979	0.8	1	0.014	0.0756	7.96%	-8.57%

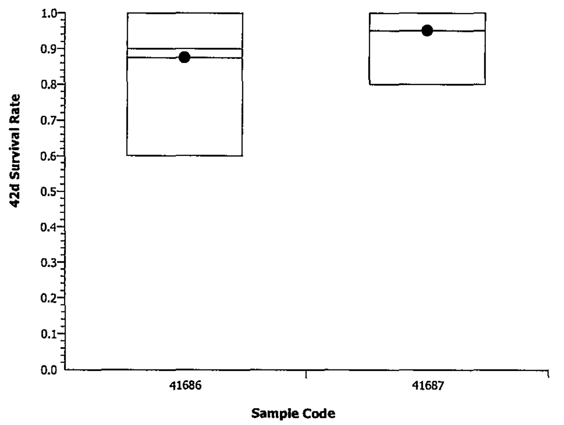
Angular (Corrected) Transformed Summary

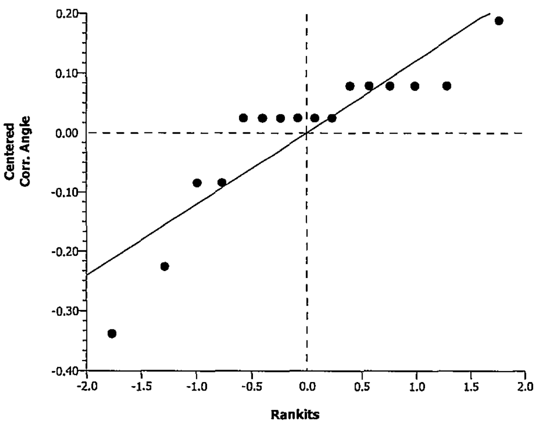
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.22	1.17	1.28	0.886	1.41	0.0275	0.148	12.1%	0.0%
41687	8	1.33	1.29	1.38	1.11	1.41	0.0218	0.117	8.8%	-8.91%

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	0.9	0.9	0.9	0.9	0.9	0.9	0.6
41687	1	1	1	1	1	0.9	0.9	0.8

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:45 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	13-9483-7649	**Endpoint:**	42d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.52%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41688	88.5		2	0.9960	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0663479	0.0663479	1	4.64	0.0491	Significant Effect
Error	0.2001618	0.0142973	14			
Total	0.2665097	0.0806451	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.27	8.89	0.1410	Equal Variances
Distribution	Shapiro-Wilk Normality	0.79		0.0020	Non-normal Distribution

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0216	0.116	13.3%	0.0%
41688	8	0.964	0.945	0.983	0.9	1	0.00933	0.0503	5.22%	-10.1%

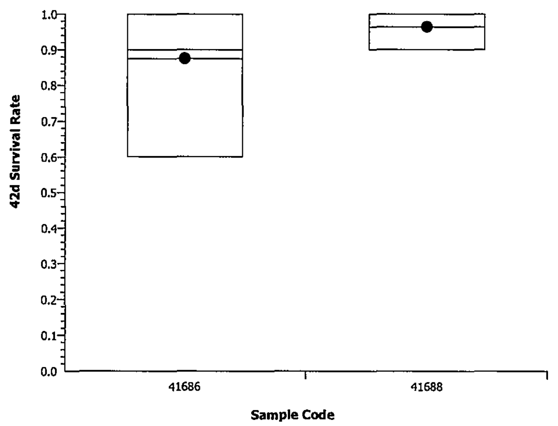
Angular (Corrected) Transformed Summary

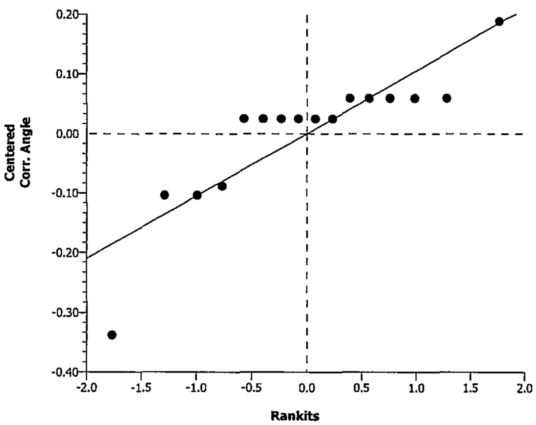
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.22	1.17	1.28	0.886	1.41	0.0275	0.148	12.1%	0.0%
41688	8	1.35	1.32	1.38	1.25	1.41	0.0152	0.0818	6.05%	-10.5%

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	0.9	0.9	0.9	0.9	0.9	0.9	0.6
41688	1	1	1	1	1	0.909	0.9	0.9

Graphics





CETIS Analytical Report

Report Date: 04 Dec-11 09:45 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	18-4842-6841	**Endpoint:**	42d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					6.95%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41689	36		0	0.0001	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	4.367218	4.367218	1	346	0.0000	Significant Effect
Error	0.1765451	0.0126104	14			
Total	4.543763	4.379828	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	6.6	8.89	0.0236	Equal Variances
Distribution	Shapiro-Wilk Normality	0.712		0.0002	Non-normal Distribution

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0216	0.116	13.3%	0.0%
41689	8	0.0125	0	0.0259	0	0.1	0.00657	0.0354	283.0%	98.6%

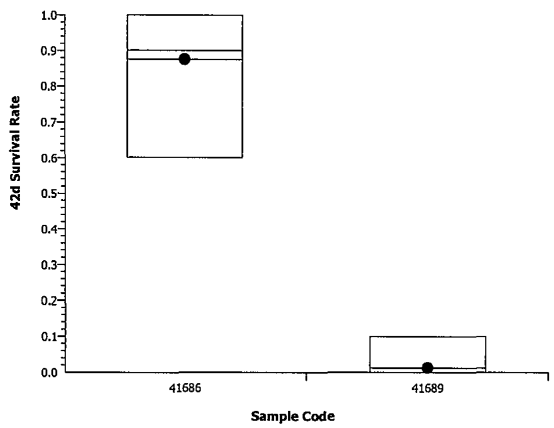
Angular (Corrected) Transformed Summary

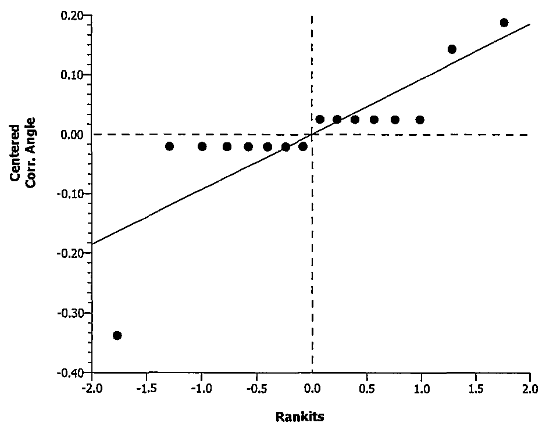
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.22	1.17	1.28	0.886	1.41	0.0275	0.148	12.1%	0.0%
41689	8	0.179	0.157	0.201	0.159	0.322	0.0107	0.0576	32.2%	85.4%

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	0.9	0.9	0.9	0.9	0.9	0.9	0.6
41689	0.1	0	0	0	0	0	0	0

Graphics





Analyst:________ QA: 12/15/11

R2-0001718

CETIS Analytical Report

Report Date:	04 Dec-11 09:45 (p 1 of 1)	**Link/Link Code:**	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	12-3386-2727	**Endpoint:**	42d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					10.3%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41690	0.666	1.76	0.136	0.2580	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0105421	0.0105421	1	0.444	0.5160	Non-Significant Effect
Error	0.3327666	0.0237690	14			
Total	0.3433087	0.0343111	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.17	8.89	0.8410	Equal Variances
Distribution	Shapiro-Wilk Normality	0.88		0.0384	Normal Distribution

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0216	0.116	13.3%	0.0%
41690	8	0.838	0.792	0.883	0.7	1	0.0221	0.119	14.2%	4.29%

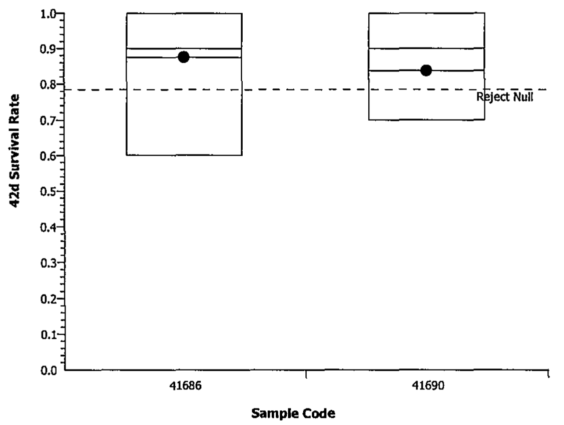
Angular (Corrected) Transformed Summary

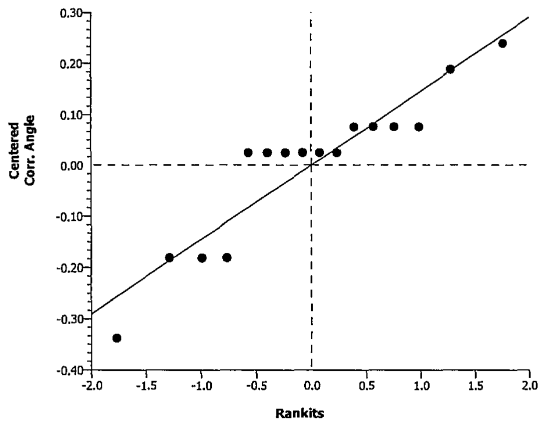
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.22	1.17	1.28	0.886	1.41	0.0275	0.148	12.1%	0.0%
41690	8	1.17	1.11	1.23	0.991	1.41	0.0297	0.16	13.7%	4.19%

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	0.9	0.9	0.9	0.9	0.9	0.9	0.6
41690	1	0.9	0.9	0.9	0.9	0.7	0.7	0.7

Graphics





Analyst:________ QA: J 12/15/11

CETIS Analytical Report

Report Date: 04 Dec-11 09:45 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	06-4700-4868	**Endpoint:**	42d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					9.03%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41739	-0.732	1.76	0.122	0.7620	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0102574	0.0102574	1	0.536	0.4760	Non-Significant Effect
Error	0.2679941	0.0191424	14			
Total	0.2782515	0.0293998	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.34	8.89	0.7110	Equal Variances
Distribution	Shapiro-Wilk Normality	0.885		0.0466	Normal Distribution

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0216	0.116	13.3%	0.0%
41739	8	0.913	0.881	0.944	0.8	1	0.0155	0.0835	9.15%	-4.29%

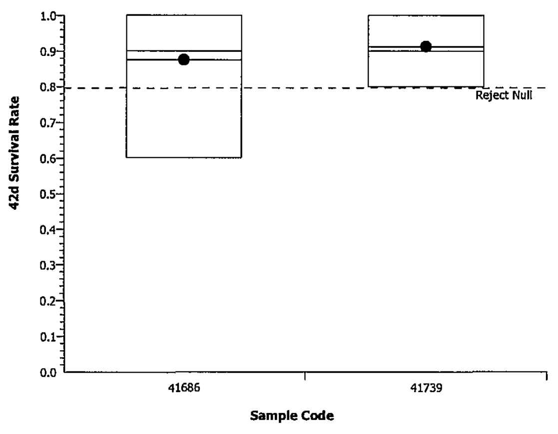
Angular (Corrected) Transformed Summary

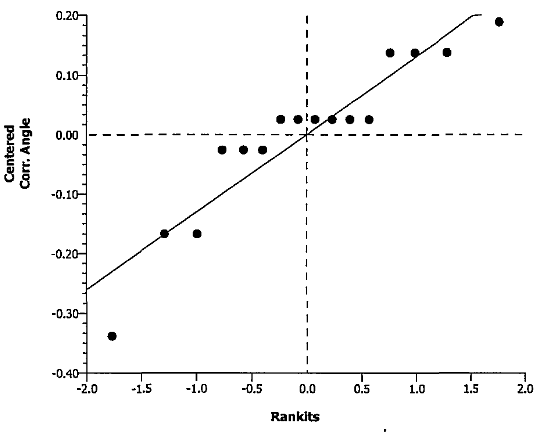
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.22	1.17	1.28	0.886	1.41	0.0275	0.148	12.1%	0.0%
41739	8	1.27	1.23	1.32	1.11	1.41	0.0238	0.128	10.0%	-4.14%

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	0.9	0.9	0.9	0.9	0.9	0.9	0.6
41739	1	1	1	0.9	0.9	0.9	0.8	0.8

Graphics





Analyst:________ QA: 12/15/11

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 13-4321-0002 **Endpoint:** 42d Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 18 Dec-11 11:58 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					11.2%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41740	1.01	1.76	0.145	0.1640	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0279113	0.0279113	1	1.03	0.3280	Non-Significant Effect
Error	0.3811376	0.0272241	14			
Total	0.4090489	0.0551354	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.49	8.89	0.6140	Equal Variances
Distribution	Shapiro-Wilk Normality	0.845		0.0116	Normal Distribution

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0216	0.116	13.3%	0.0%
41740	8	0.813	0.757	0.868	0.5	1	0.0271	0.146	17.9%	7.14%

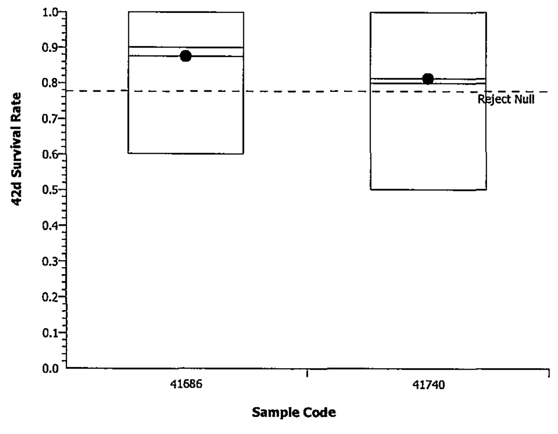
Angular (Corrected) Transformed Summary

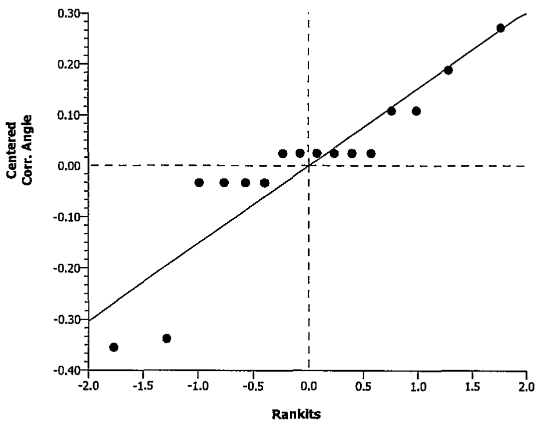
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.22	1.17	1.28	0.886	1.41	0.0275	0.148	12.1%	0.0%
41740	8	1.14	1.07	1.21	0.785	1.41	0.0335	0.18	15.8%	6.82%

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	0.9	0.9	0.9	0.9	0.9	0.9	0.6
41740	1	0.9	0.9	0.8	0.8	0.8	0.8	0.5

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:45 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	20-4606-3485	**Endpoint:**	42d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					7.59%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41741	85.5		2	0.9960	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0643700	0.0643700	1	4.44	0.0537	Non-Significant Effect
Error	0.2031044	0.0145075	14			
Total	0.2674744	0.0788775	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.08	8.89	0.1610	Equal Variances
Distribution	Shapiro-Wilk Normality	0.792		0.0021	Non-normal Distribution

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0216	0.116	13.3%	0.0%
41741	8	0.963	0.943	0.982	0.9	1	0.00961	0.0518	5.38%	-10.0%

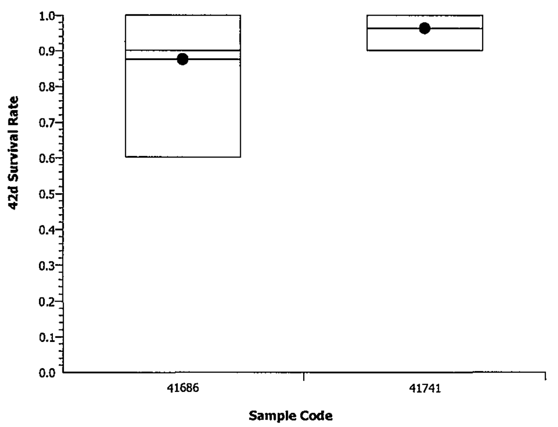
Angular (Corrected) Transformed Summary

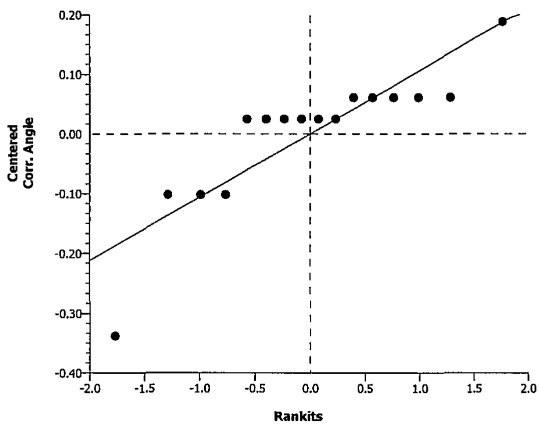
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.22	1.17	1.28	0.886	1.41	0.0275	0.148	12.1%	0.0%
41741	8	1.35	1.32	1.38	1.25	1.41	0.0157	0.0843	6.24%	-10.4%

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	0.9	0.9	0.9	0.9	0.9	0.9	0.6
41741	1	1	1	1	1	0.9	0.9	0.9

Graphics





J 12/15/11

R2-0001722

CETIS Analytical Report

Report Date:	04 Dec-11 09:45 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	20-0523-8871	**Endpoint:**	42d Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	20000 Trial					11.4%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41742	61.5		2	0.2620	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0092387	0.0092387	1	0.33	0.5750	Non-Significant Effect
Error	0.3924028	0.0280288	14			
Total	0.4016415	0.0372675	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.56	8.89	0.5720	Equal Variances
Distribution	Shapiro-Wilk Normality	0.814		0.0042	Non-normal Distribution

42d Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.875	0.831	0.919	0.6	1	0.0216	0.116	13.3%	0.0%
41742	8	0.838	0.78	0.895	0.5	1	0.028	0.151	18.0%	4.29%

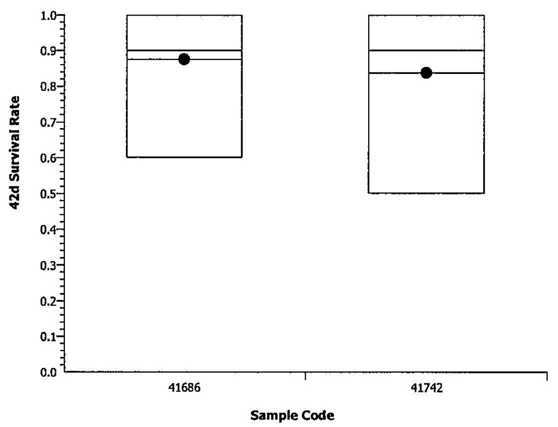
Angular (Corrected) Transformed Summary

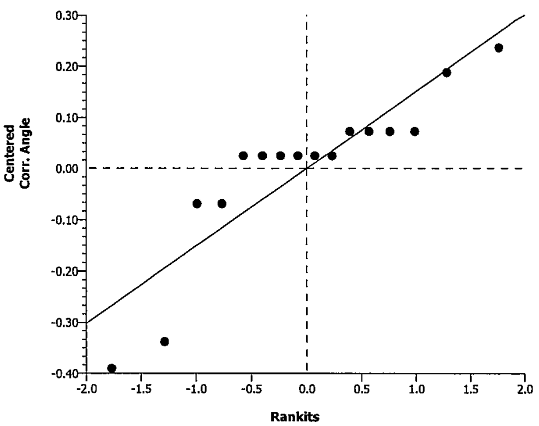
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	1.22	1.17	1.28	0.886	1.41	0.0275	0.148	12.1%	0.0%
41742	8	1.18	1.11	1.25	0.785	1.41	0.0343	0.185	15.7%	3.93%

42d Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	1	0.9	0.9	0.9	0.9	0.9	0.9	0.6
41742	1	0.9	0.9	0.9	0.9	0.8	0.8	0.5

Graphics





Analyst:________ QA: G 12/15/11

R2-0001723

CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	10-3289-6841	**Endpoint:**	42d Mean Dry Weight	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					11.6%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41687	-1.76	1.76	0.0381	0.9500	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0058406	0.0058406	1	3.12	0.0994	Non-Significant Effect
Error	0.0262487	0.0018749	14			
Total	0.0320892	0.0077155	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.93	8.89	0.4040	Equal Variances
Distribution	Shapiro-Wilk Normality	0.954		0.5530	Normal Distribution

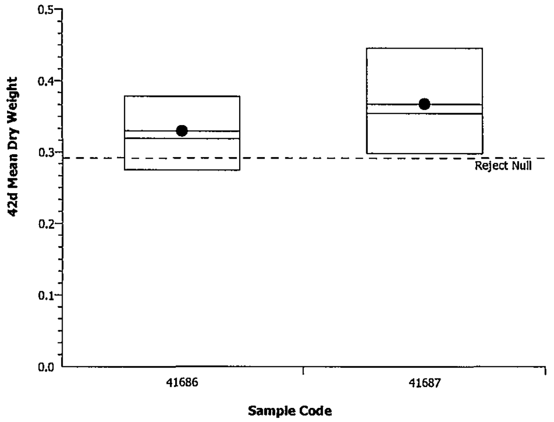
42d Mean Dry Weight Summary

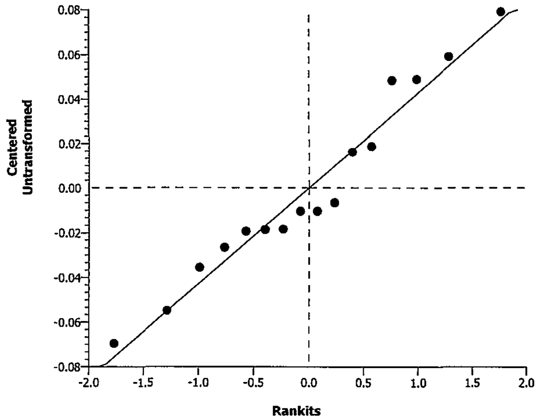
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00664	0.0358	10.9%	0.0%
41687	8	0.368	0.349	0.386	0.298	0.447	0.00923	0.0497	13.5%	-11.6%

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.378	0.346	0.319	0.319	0.311	0.31	0.274
41687	0.447	0.427	0.386	0.361	0.349	0.341	0.332	0.298

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	08-1079-1919	**Endpoint:**	42d Mean Dry Weight	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					8.52%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41688	0.0985	1.76	0.0281	0.4610	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	9.853E-06	9.853E-06	1	0.0097	0.9230	Non-Significant Effect
Error	0.0142223	0.0010159	14			
Total	0.0142322	0.0010257	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.7	8.89	0.5010	Equal Variances
Distribution	Shapiro-Wilk Normality	0.963		0.7080	Normal Distribution

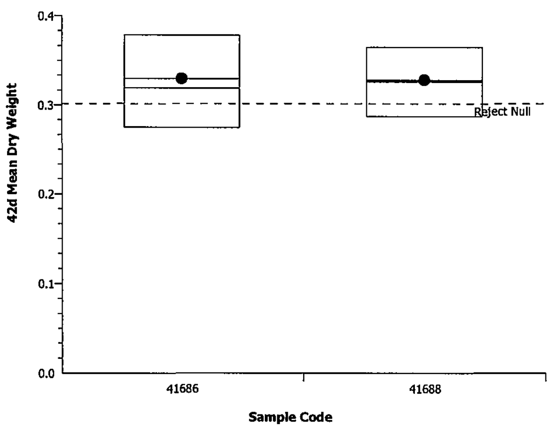
42d Mean Dry Weight Summary

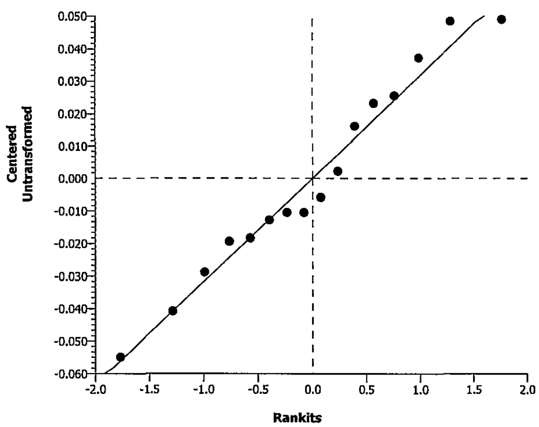
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00664	0.0358	10.9%	0.0%
41688	8	0.328	0.317	0.338	0.287	0.365	0.0051	0.0274	8.37%	0.48%

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.378	0.346	0.319	0.319	0.311	0.31	0.274
41688	0.365	0.353	0.351	0.33	0.322	0.315	0.299	0.287

Graphics





Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	12-9907-5283	**Endpoint:**	42d Mean Dry Weight	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					21.8%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41689	-1.86	1.89	0.0719	0.9480	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0044356	0.0044356	1	3.47	0.1050	Non-Significant Effect
Error	0.0089519	0.0012788	7			
Total	0.0133875	0.0057145	8			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Distribution	Shapiro-Wilk Normality	0.925		0.4320	Normal Distribution

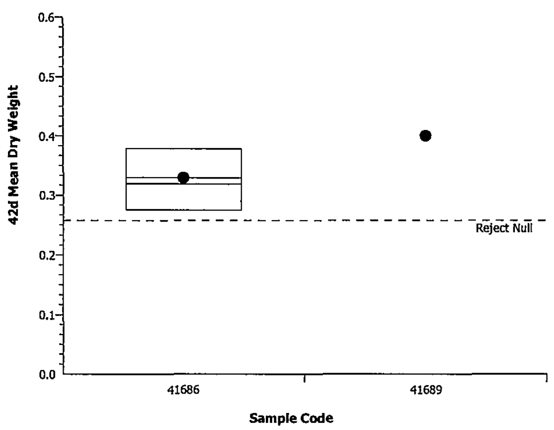
42d Mean Dry Weight Summary

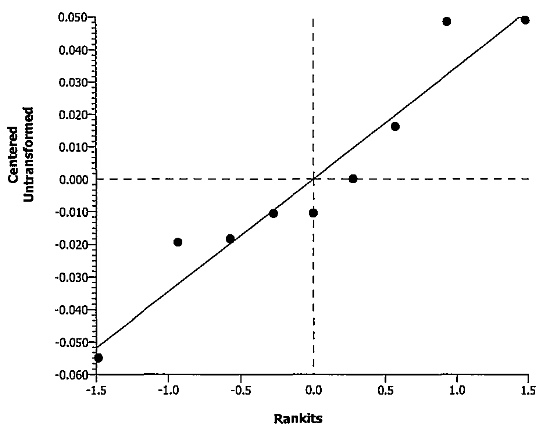
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00664	0.0358	10.9%	0.0%
41689	1	0.4			0.4	0.4	0	0	0.0%	-21.4%

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.378	0.346	0.319	0.319	0.311	0.31	0.274
41689	0.4							

Graphics





CETIS Analytical Report

	Report Date:	04 Dec-11 09:44 (p 1 of 1)
	Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	06-4937-5199	**Endpoint:**	42d Mean Dry Weight	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					11.6%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41690	-1.97	1.76	0.0382	0.9650	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0072926	0.0072926	1	3.87	0.0693	Non-Significant Effect
Error	0.0263812	0.0018844	14			
Total	0.0336738	0.009177	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.95	8.89	0.3990	Equal Variances
Distribution	Shapiro-Wilk Normality	0.972		0.8740	Normal Distribution

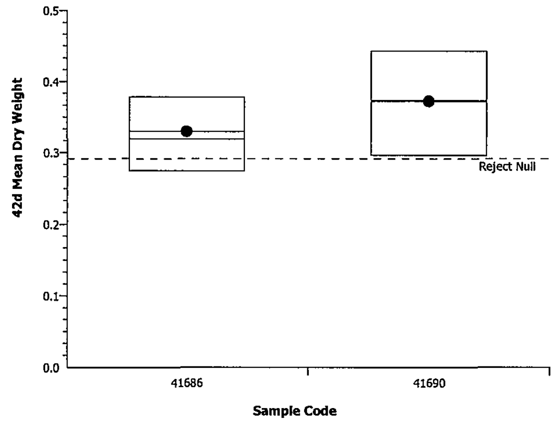
42d Mean Dry Weight Summary

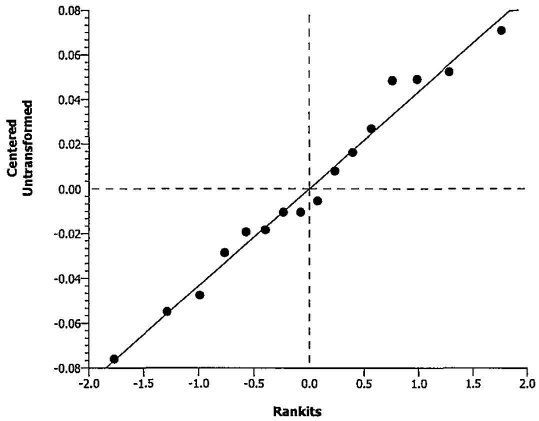
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00664	0.0358	10.9%	0.0%
41690	8	0.372	0.353	0.391	0.296	0.443	0.00927	0.0499	13.4%	-13.0%

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.378	0.346	0.319	0.319	0.311	0.31	0.274
41690	0.443	0.424	0.399	0.38	0.367	0.343	0.324	0.296

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	05-2163-9646	**Endpoint:**	42d Mean Dry Weight	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					8.38%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41739	-0.0324	1.76	0.0276	0.5130	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	1.028E-06	1.028E-06	1	0.00105	0.9750	Non-Significant Effect
Error	0.0137396	0.0009814	14			
Total	0.0137407	0.0009824	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.87	8.89	0.4280	Equal Variances
Distribution	Shapiro-Wilk Normality	0.927		0.2170	Normal Distribution

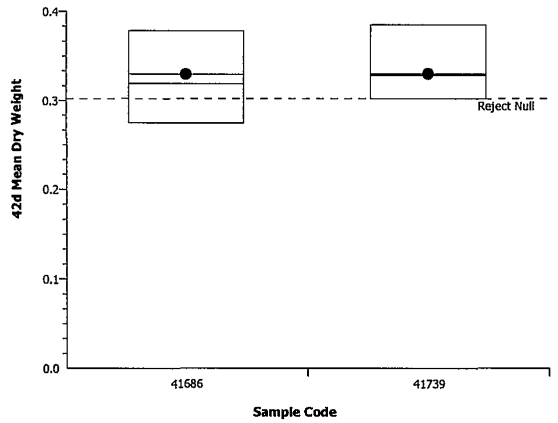
42d Mean Dry Weight Summary

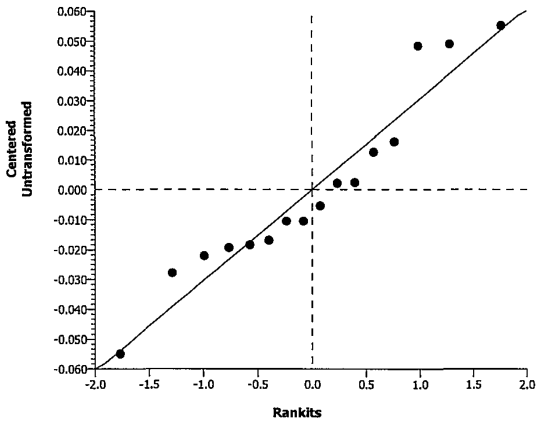
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00664	0.0358	10.9%	0.0%
41739	8	0.33	0.32	0.34	0.302	0.385	0.00486	0.0262	7.93%	-0.15%

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.378	0.346	0.319	0.319	0.311	0.31	0.274
41739	0.385	0.343	0.332	0.332	0.324	0.313	0.308	0.302

Graphics





Analyst:________ QA:________ 12/15/11

R2-0001728

CETIS Analytical Report

Report Date: 18 Dec-11 11:58 (p 1 of 2)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 03-1952-0703 **Endpoint:** 42d Mean Dry Weight **CETIS Version:** CETISv1.6.4
Analyzed: 18 Dec-11 11:58 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					7.99%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41740	-1.46	1.76	0.0263	0.9170	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0018989	0.0018989	1	2.13	0.1670	Non-Significant Effect
Error	0.0124963	0.0008926	14			
Total	0.0143952	0.0027915	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	2.53	8.89	0.2450	Equal Variances
Distribution	Shapiro-Wilk Normality	0.966		0.7790	Normal Distribution

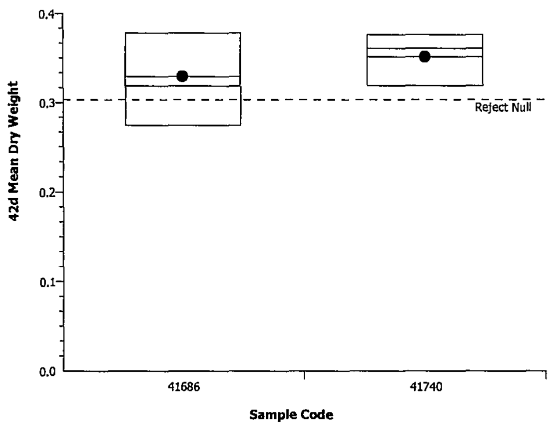
42d Mean Dry Weight Summary

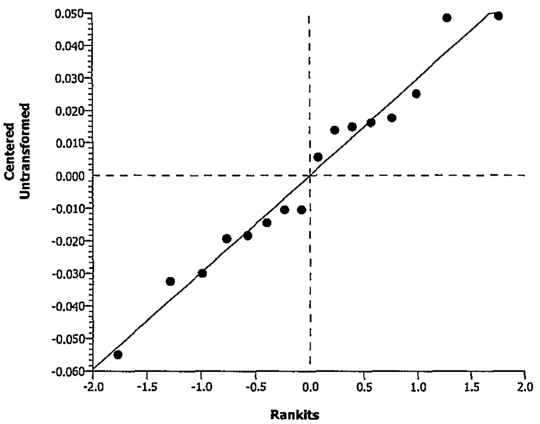
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00664	0.0358	10.9%	0.0%
41740	8	0.351	0.343	0.36	0.319	0.376	0.00418	0.0225	6.41%	-6.62%

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.378	0.346	0.319	0.319	0.311	0.31	0.274
41740	0.376	0.369	0.366	0.365	0.357	0.337	0.321	0.319

Graphics





Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	09-9962-5828	**Endpoint:**	42d Mean Dry Weight	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					11.1%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41741	-1.42	1.76	0.0365	0.9110	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0034385	0.0034385	1	2	0.1790	Non-Significant Effect
Error	0.0240214	0.0017158	14			
Total	0.0274599	0.0051543	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.68	8.89	0.5080	Equal Variances
Distribution	Shapiro-Wilk Normality	0.947		0.4430	Normal Distribution

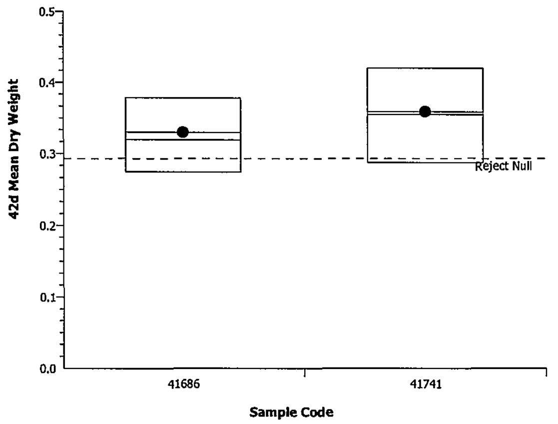
42d Mean Dry Weight Summary

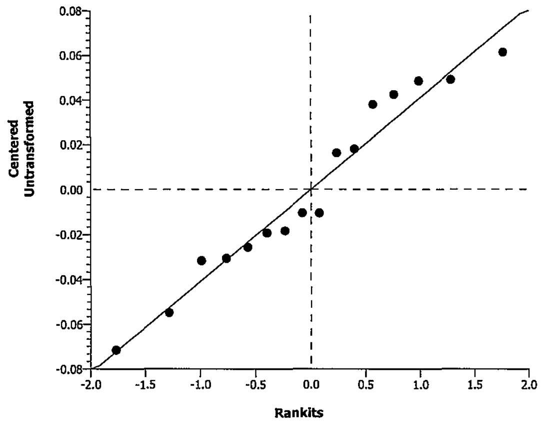
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00664	0.0358	10.9%	0.0%
41741	8	0.359	0.341	0.376	0.287	0.42	0.00862	0.0464	12.9%	-8.9%

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.378	0.346	0.319	0.319	0.311	0.31	0.274
41741	0.42	0.401	0.397	0.377	0.333	0.328	0.327	0.287

Graphics





Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 11-7358-8978 **Endpoint:** 42d Mean Dry Weight **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:41 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					10.3%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41742	-0.841	1.76	0.0339	0.7930	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0010513	0.0010513	1	0.708	0.4140	Non-Significant Effect
Error	0.0208013	0.0014858	14			
Total	0.0218526	0.0025371	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.32	8.89	0.7210	Equal Variances
Distribution	Shapiro-Wilk Normality	0.961		0.6820	Normal Distribution

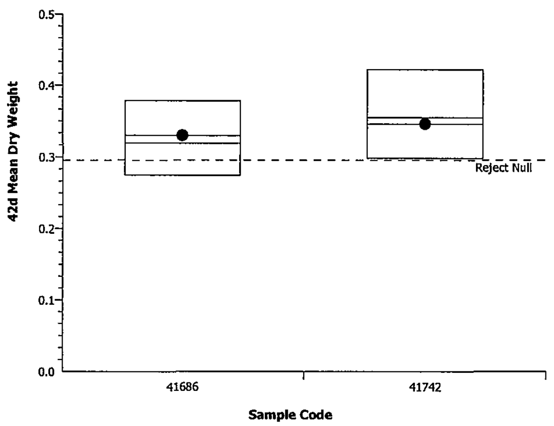
42d Mean Dry Weight Summary

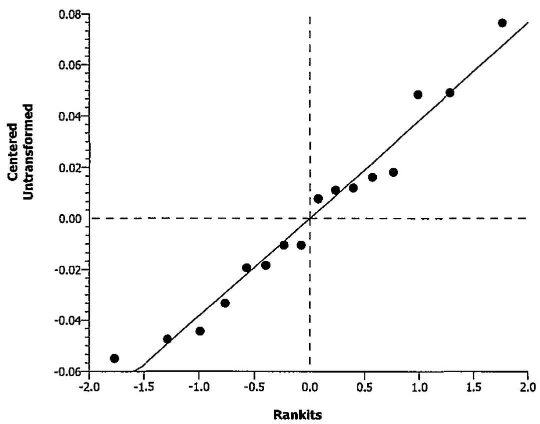
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	0.329	0.316	0.343	0.274	0.378	0.00664	0.0358	10.9%	0.0%
41742	8	0.346	0.33	0.361	0.298	0.422	0.00764	0.0411	11.9%	-4.92%

42d Mean Dry Weight Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	0.378	0.378	0.346	0.319	0.319	0.311	0.31	0.274
41742	0.422	0.364	0.357	0.357	0.353	0.312	0.301	0.298

Graphics





CETIS Analytical Report

Report Date: 04 Dec-11 09:44 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 04-8332-7022 **Endpoint:** 42d Reproduction **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:43 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					37.6%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41687	-0.862	1.76	1.39	0.7980	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	1.848305	1.848305	1	0.743	0.4030	Non-Significant Effect
Error	34.83183	2.487988	14			
Total	36.68013	4.336292	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.14	8.89	0.0805	Equal Variances
Distribution	Shapiro-Wilk Normality	0.963		0.7130	Normal Distribution

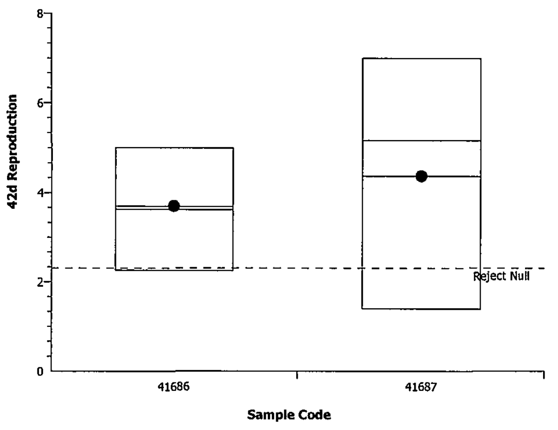
42d Reproduction Summary

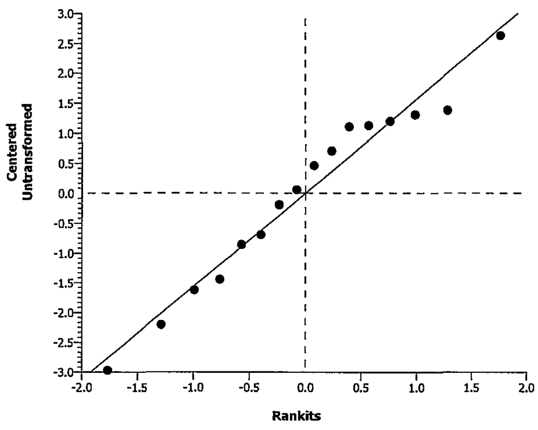
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.07	2.25	5	0.183	0.984	26.7%	0.0%
41687	8	4.37	3.61	5.13	1.4	7	0.372	2	45.8%	-18.4%

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	5	4.8	4.4	3.75	3.5	3	2.83	2.25
41687	7	5.75	5.57	5.5	4.83	2.75	2.17	1.4

Graphics





Analyst:________ QA: S 12/16/11

R2-0001732

CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	18-3988-3852	**Endpoint:**	42d Reproduction	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:43	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					21.8%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41688	2.33	1.76	0.806	0.0175	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	4.558733	4.558733	1	5.44	0.0351	Significant Effect
Error	11.72794	0.8377101	14			
Total	16.28667	5.396443	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.37	8.89	0.6900	Equal Variances
Distribution	Shapiro-Wilk Normality	0.952		0.5220	Normal Distribution

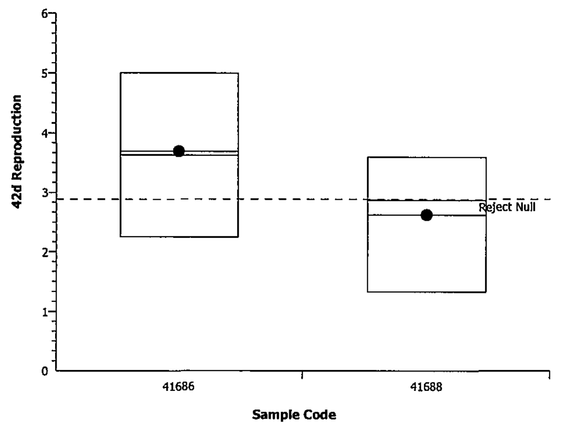
42d Reproduction Summary

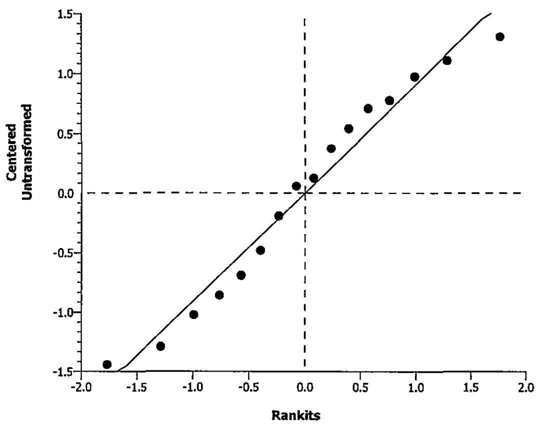
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.07	2.25	5	0.183	0.984	26.7%	0.0%
41688	8	2.62	2.3	2.94	1.33	3.6	0.156	0.841	32.1%	28.9%

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	5	4.8	4.4	3.75	3.5	3	2.83	2.25
41688	3.6	3.4	3.17	3	2.75	2.14	1.6	1.33

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	02-7695-3676	**Endpoint:**	42d Reproduction	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:43	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					53.6%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41689	3.54	1.89	1.98	0.0048	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	12.11414	12.11414	1	12.5	0.0095	Significant Effect
Error	6.775556	0.9679365	7			
Total	18.88969	13.08207	8			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Distribution	Shapiro-Wilk Normality	0.966		0.8540	Normal Distribution

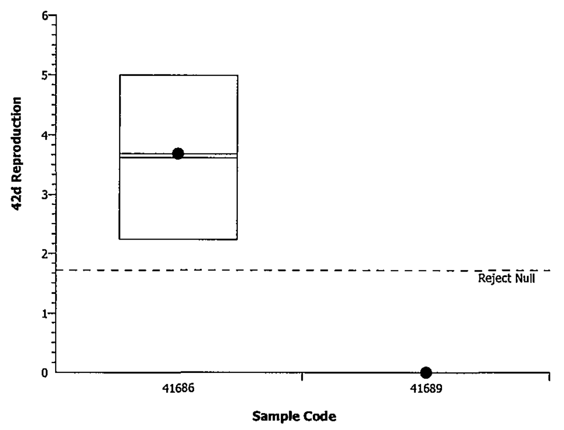
42d Reproduction Summary

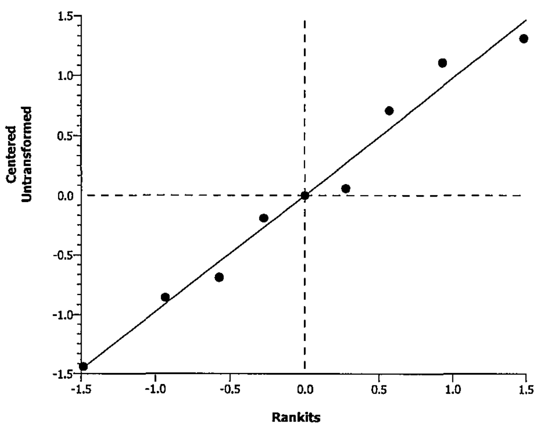
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.07	2.25	5	0.183	0.984	26.7%	0.0%
41689	1	0			0	0	0	0		100.0%

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	5	4.8	4.4	3.75	3.5	3	2.83	2.25
41689	0							

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	02-7698-8208	**Endpoint:**	42d Reproduction	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:43	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					37.5%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41690	0.0667	1.76	1.38	0.4740	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0109751	0.0109751	1	0.00445	0.9480	Non-Significant Effect
Error	34.53659	2.466899	14			
Total	34.54756	2.477874	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.1	8.89	0.0826	Equal Variances
Distribution	Shapiro-Wilk Normality	0.961		0.6820	Normal Distribution

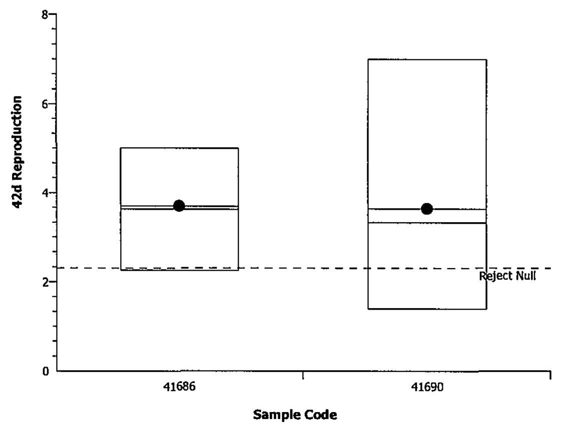
42d Reproduction Summary

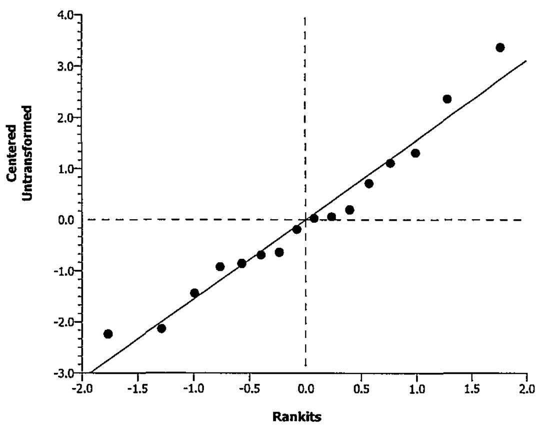
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.07	2.25	5	0.183	0.984	26.7%	0.0%
41690	8	3.64	2.88	4.4	1.4	7	0.37	1.99	54.7%	1.42%

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	5	4.8	4.4	3.75	3.5	3	2.83	2.25
41690	7	6	3.83	3.67	3	2.71	1.5	1.4

Graphics





Analyst:________ QA: J 12/15/11

R2-0001735

CETIS Analytical Report

Report Date:	04 Dec-11 09:44 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	15-6312-2427	**Endpoint:**	42d Reproduction	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:43	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					28.2%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41739	0.881	1.76	1.04	0.1970	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	1.081352	1.081352	1	0.776	0.3930	Non-Significant Effect
Error	19.51143	1.393674	14			
Total	20.59278	2.475026	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.88	8.89	0.4240	Equal Variances
Distribution	Shapiro-Wilk Normality	0.899		0.0772	Normal Distribution

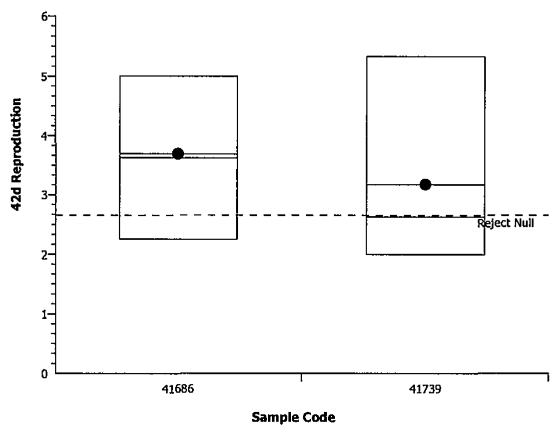
42d Reproduction Summary

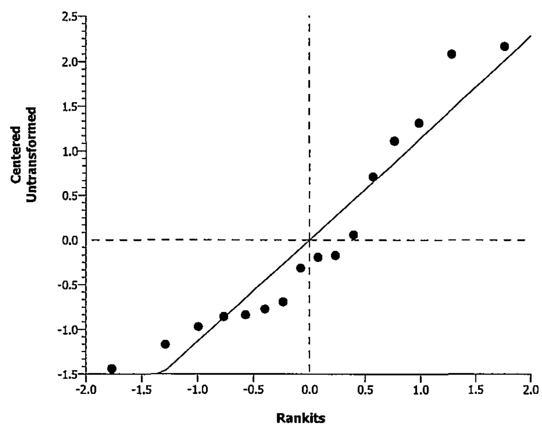
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.07	2.25	5	0.183	0.984	26.7%	0.0%
41739	8	3.17	2.66	3.68	2	5.33	0.25	1.35	42.5%	14.1%

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	5	4.8	4.4	3.75	3.5	3	2.83	2.25
41739	5.33	5.25	3	2.86	2.4	2.33	2.2	2

Graphics





CETIS Analytical Report

Report Date: 04 Dec-11 09:45 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 04-8482-7241 **Endpoint:** 42d Reproduction **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:43 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	20000 Trial					71.1%

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	P-Value	Decision(5%)
41686		41740	73		0	0.6770	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	8.098767	8.098767	1	0.912	0.3560	Non-Significant Effect
Error	124.3252	8.880375	14			
Total	132.424	16.97914	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	17.3	8.89	0.0013	Unequal Variances
Distribution	Shapiro-Wilk Normality	0.665		0.0001	Non-normal Distribution

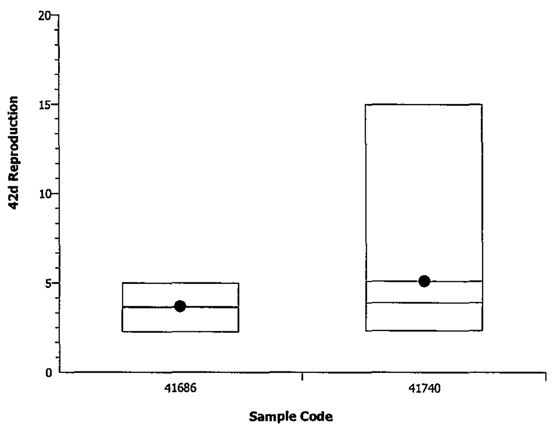
42d Reproduction Summary

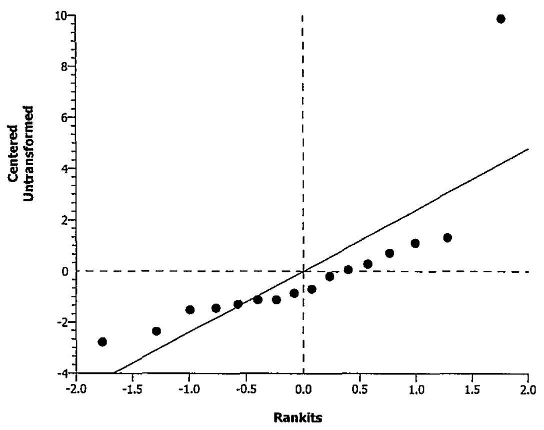
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.07	2.25	5	0.183	0.984	26.7%	0.0%
41740	8	5.11	3.56	6.67	2.33	15	0.761	4.1	80.1%	-38.5%

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	5	4.8	4.4	3.75	3.5	3	2.83	2.25
41740	15	5.4	4	4	3.83	3.6	2.75	2.33

Graphics





R2-0001737

CETIS Analytical Report

Report Date: 04 Dec-11 09:45 (p 1 of 1)
Link/Link Code: 07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 10-1186-9321 **Endpoint:** 42d Reproduction **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:43 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					22.4%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41741	0.693	1.76	0.828	0.2500	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.424049	0.424049	1	0.48	0.5000	Non-Significant Effect
Error	12.37431	0.8838789	14			
Total	12.79836	1.307928	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.21	8.89	0.8080	Equal Variances
Distribution	Shapiro-Wilk Normality	0.951		0.5080	Normal Distribution

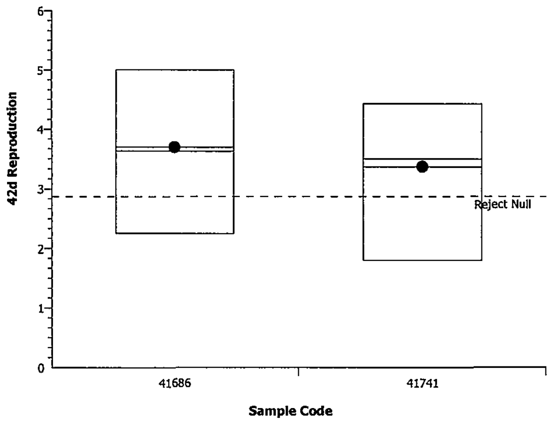
42d Reproduction Summary

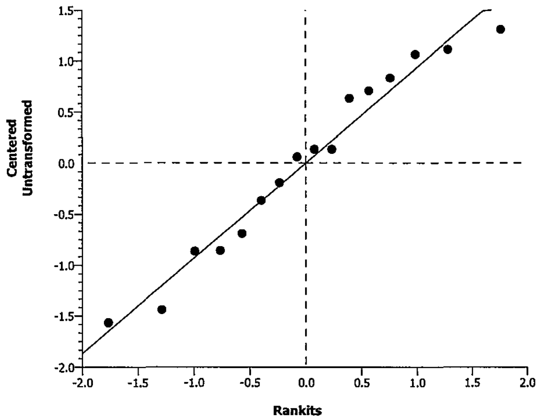
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.07	2.25	5	0.183	0.984	26.7%	0.0%
41741	8	3.37	3.03	3.71	1.8	4.43	0.166	0.894	26.6%	8.82%

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	5	4.8	4.4	3.75	3.5	3	2.83	2.25
41741	4.43	4.2	4	3.5	3.5	3	2.5	1.8

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:45 (p 1 of 1)
Link/Link Code:	07-9792-8070/12885

Hyalella 42-d Survival, Growth, and Reproduction Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	06-0591-9466	**Endpoint:**	42d Reproduction	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:43	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					36.3%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41742	1.1	1.76	1.34	0.1440	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	2.815604	2.815604	1	1.22	0.2890	Non-Significant Effect
Error	32.40366	2.314547	14			
Total	35.21926	5.130151	15			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.78	8.89	0.1000	Equal Variances
Distribution	Shapiro-Wilk Normality	0.883		0.0427	Normal Distribution

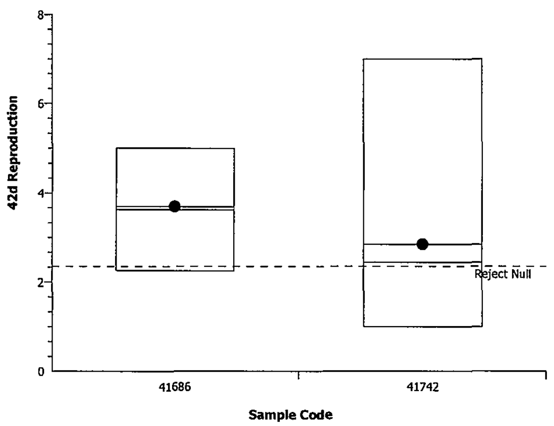
42d Reproduction Summary

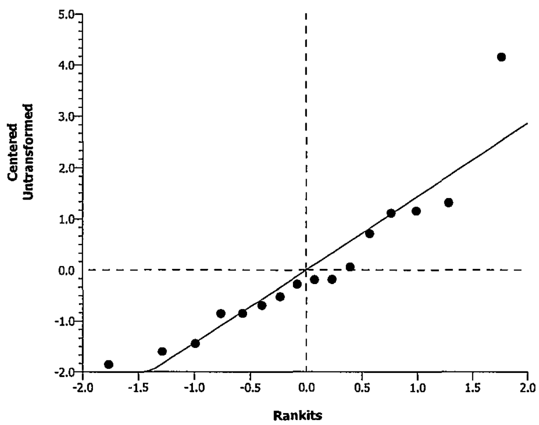
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	8	3.69	3.32	4.07	2.25	5	0.183	0.984	26.7%	0.0%
41742	8	2.85	2.12	3.58	1	7	0.355	1.91	67.1%	22.7%

42d Reproduction Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
41686	5	4.8	4.4	3.75	3.5	3	2.83	2.25
41742	7	4	2.67	2.57	2.33	2	1.25	1

Graphics





Amphipod (*Hyalella azteca*) Sediment Toxicity Test Results

SDG: 12885
Project: 11050

Sample Code	Rep	Pos	# Exposed	28d Survival	35d Survival	35d # Young	42d Survival	42d # Young	# Females	42d Pan Count	42d Tare Weight-mg	42d Total Weight-mg
41686	1	43	10	9	9	8	9	13	6	9	25.8	29.2
41686	2	49	10	10	10	4	9	2	2	9	25.91	28.38
41686	3	53	10	10	10	12	9	12	5	9	25.21	28.08
41686	4	63	10	10	10	4	9	5	4	9	25.92	28.71
41686	5	4	10	10	10	9	10	6	4	10	25.22	28.33
41686	6	41	10	9	9	22	9	0	5	9	25.23	28.34
41686	7	32	10	6	6	4	6	16	4	6	24.73	27
41686	8	56	10	9	9	3	9	14	6	9	25.8	28.67
41687	1	67	10	10	10	4	10	7	4	10	24.68	28.17
41687	2	46	10	10	10	14	10	25	7	10	25.06	28.67
41687	3	71	10	10	10	2	10	5	5	10	24.66	27.98
41687	4	12	10	9	9	8	9	15	4	9	25.28	29.3
41687	5	29	10	9	9	15	8	14	6	8	24.08	27.17
41687	6	65	10	10	10	5	10	8	6	10	24.46	27.44
41687	7	19	10	10	10	5	10	17	4	10	23.84	27.25
41687	8	25	10	9	9	6	9	8	2	9	24.98	28.82
41688	1	23	10	10	10	8	10	9	5	10	25.66	28.81
41688	2	27	10	10	10	4	9	2	2	9	24.71	27.68
41688	3	38	10	10	10	3	10	5	6	10	24.52	27.51
41688	4	39	11	11	11	9	10	10	6	10	25.06	28.28
41688	5	7	10	10	10	10	10	12	8	10	25.92	29.43
41688	6	11	10	9	9	9	9	6	7	9	25.7	28.88
41688	7	52	10	10	10	1	10	7	5	10	24.55	27.42
41688	8	2	10	10	10	9	10	9	5	10	25.05	28.7
41689	1	51	10	0	0	0	0	0	0	0	0	0
41689	2	3	10	0	0	0	0	0	0	0	0	0
41689	3	1	10	0	0	0	0	0	0	0	0	0
41689	4	48	10	0	0	0	0	0	0	0	0	0
41689	5	54	10	1	1	0	1	0	1	1	24.96	25.36
41689	6	16	10	0	0	0	0	0	0	0	0	0
41689	7	60	10	0	0	0	0	0	0	0	0	0
41689	8	58	10	1	1	0	0	0	0	0	0	0
41690	1	21	10	7	7	3	7	0	2	7	24.36	27.33
41690	2	6	10	10	10	5	9	19	4	9	24.14	27.06
41690	3	10	10	9	8	11	7	17	4	7	24.61	27.27
41690	4	13	10	8	8	7	7	4	3	7	24.92	28.02
41690	5	69	10	9	9	4	9	3	5	9	24.63	27.93
41690	6	26	10	9	9	0	9	19	7	9	24.95	28.54
41690	7	50	10	10	10	4	10	19	6	10	25.33	28.29
41690	8	66	10	9	9	6	9	9	5	9	24.75	27.84
41739	1	37	10	10	10	4	10	11	5	10	25.75	28.88
41739	2	42	10	10	10	9	10	2	5	10	24.47	27.79
41739	3	20	10	9	9	2	9	2	2	9	24.5	27.49
41739	4	22	10	10	10	13	9	7	7	9	25.47	28.24
41739	5	15	10	10	10	9	9	3	5	9	24.77	27.69
41739	6	55	10	9	9	19	8	2	4	8	24.49	27.23
41739	7	64	10	9	9	11	8	5	3	8	24.99	28.07
41739	8	62	10	10	10	7	10	0	3	10	25.43	28.45
41740	1	57	10	10	10	9	9	2	4	9	25.05	28.26
41740	2	30	10	9	9	5	8	2	3	8	26.18	29.19
41740	3	31	10	10	10	10	10	8	5	9	24.93	27.96
41740	4	47	10	9	9	4	8	8	3	8	27.77	30.72
41740	5	9	10	10	9	7	5	8	1	5	25.15	26.98

Aquatec Biological Sciences, Inc.
Reviewed by: [signature] Date: 12/21/11

Amphipod (*Hyalella azteca*) Sediment Toxicity Test Results

SDG: 12885
Project: 11050

Sample Code	Rep	Pos	# Exposed	28d Survival	35d Survival	35d # Young	42d Survival	42d # Young	# Females	42d Pan Count	42d Tare Weight-mg	42d Total Weight-mg
41740	6	70	10	9	9	18	8	9	5	8	25.18	28.1
41740	7	17	10	10	9	8	8	16	6	8	25.28	27.83
41740	8	35	10	10	10	15	9	8	6	9	24.75	27.64
41741	1	68	10	10	10	11	10	10	5	10	25.67	28.95
41741	2	5	10	10	9	5	9	2	2	9	26.09	29.7
41741	3	44	10	10	10	5	10	4	5	10	25.41	28.74
41741	4	45	10	10	10	17	10	14	7	10	24.95	27.82
41741	5	33	10	10	10	10	10	5	6	10	25.95	29.22
41741	6	36	10	10	10	0	10	6	2	10	26.06	30.26
41741	7	24	10	10	9	6	9	6	3	9	24.08	27.65
41741	8	14	10	10	10	0	9	7	2	9	25.53	28.92
41742	1	72	10	9	8	0	8	3	3	8	24.35	27.26
41742	2	34	10	9	9	17	9	11	7	9	25.1	28.28
41742	3	40	10	10	9	3	9	15	7	9	24.38	27.09
41742	4	59	10	9	9	0	9	8	3	9	24.61	27.82
41742	5	8	10	10	10	0	10	5	4	10	25.87	28.85
41742	6	61	10	6	6	0	5	14	2	5	25.39	27.5
41742	7	18	10	9	9	4	9	10	6	9	24.74	27.55
41742	8	28	10	8	8	0	8	6	3	8	24.78	27.64

Project: TRC SMC 002 Supplemental

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

DAY 28 - TEST DATA:

Sample Number		Rep.	Surviving Number	Initials	Repick	Initials	Total Surviving	Number weighed	Initial Pan Weight	Final Pan Weight
Control	41686	A	9	KK	—	—	9	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
		B	10	KK	—	—	10			
		C	10	KK	—	—	10			
		D	10	KK	—	—	10			
		E	10	KK	—	—	10			
		F	9	KK	—	—	9			
		G	10	KK	0	J	10			
		H	9	KK	—	—	9			
SD-23	41687	A	10	JG	—	—	10	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
		B	10	JG	—	—	10			
		C	10	JG	—	—	10			
		D	9	JG	—	—	9			
		E	9	JG	—	—	9			
		F	10	JG	—	—	10			
		G	10	JG	—	—	10			
		H	9	JG	—	—	9			
SD-04	41688	A	10	J	—	—	10	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
		B	10	J	—	—	10			
		C	10	J	—	—	10			
		D	11	J	—	—	11			
		E	10	J	—	—	10			
		F	9	J	—	—	9			
		G	10	J	—	—	10			
		H	10	J	—	—	10			
SD-18	41689	A	0	JG	0	J	0	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
		B	0	JG	0	J	0			
		C	0	JG	0	J	0			
		D	0	JG	0	J	0			
		E	JG ~~0~~ 1	JG	0	KK	1			
		F	0	JG	0	KK	0			
		G	0	JG	0	J	0			
		H	0	JG	1	KK	1			

~~11/24/11~~
11/17/11 J
(date correction for Day 28)

NOTES:

Date/Init (Initial Pan Weights):	
IN (Date/Time/Temp/Init):	
OUT (Date/Time/Temp/Init):	

Aquatec Biological Sciences, Inc.
Reviewed by: J Date: 12/15/11

SDG: 12885
Project: 11050

R2-0001742

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

DAY 28 - TEST DATA:

Sample Number		Rep.	Surviving Number	Initials	Repick	Initials	Total Surviving	Number weighed	Initial Pan Weight	Final Pan Weight
SD-15	41690	A	~~9~~ 7	KK	0	JG	7	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
		B	10	KK	—	—	10			
		C	9	KK	—	—	9			
		D	8	KK	—	—	8			
		E	9	KK	—	—	9			
		F	9	KK	—	—	9			
		G	10	KK	—	—	10			
		H	9	KK	—	—	9			
SD-31	41739	A	10	JG	—	—	10	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
		B	10	JG	—	—	10			
		C	9	JG	—	—	9			
		D	10	JG	—	—	10			
		E	10	JG	—	—	10			
		F	9	JG	—	—	9			
		G	9	JG	—	—	9			
		H	10	JG	—	—	10			
SD-35A	41740	A	10	KK	—	—	10	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
		B	9	KK	—	—	9			
		C	10	KK	—	—	10			
		D	9	KK	—	—	9			
		E	10	KK	—	—	10			
		F	9	KK	—	—	9			
		G	10	KK	—	—	10			
		H	~~9~~ 10	KK	—	—	~~9~~ 10			
SD-13	41741	A	10	J	—	—	10	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
		B	10	J	—	—	10			
		C	10	J	—	—	10			
		D	10	J	—	—	10			
		E	10	J	—	—	10			
		F	10	J	—	—	10			
		G	10	J	—	—	10			
		H	10	J	—	—	10			

11/12/11 J

NOTES:

Date/Init (Initial Pan Weights):
IN (Date/Time/Temp/Init):
OUT (Date/Time/Temp/Init):

Aquatec Biological Sciences, Inc.
Reviewed by: J Date: 12/15/11

75

SDG: 12885
Project: 11050

R2-0001743

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

DAY 28 - TEST DATA:

Sample Number	Rep.	Surviving Number	Initials	Repick	Initials	Total Surviving	Number weighed	Initial Pan Weight	Final Pan Weight
41742	A	9	JG	—	—	9	Replicates A - H: Continued for 35 - 42 day survival and reproduction endpoints.		
SD-10	B	9	JG	—	—	9			
	C	10	JG	—	—	10			
	D	9	JG	—	—	9			
	E	10	JG	—	—	10			
	F	6	JG	0	J	6			
	G	9	JG	—	—	9			
	H	8	JG	0	J	8			

~~11/24/11~~
11/17/11 J

NOTES:

Date/Init (Initial Pan Weights):	
IN (Date/Time/Temp/Init):	
OUT (Date/Time/Temp/Init):	

Aquatec Biological Sciences, Inc.
Reviewed by: J Date: 12/15/11

SDG: 12885
Project: 11050

Project: TRC SMC 002 Supplemental Test ID: **63169**

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

SEDIMENT TEST DATA:

Sample Number	Rep.	Day 35 Surviving #	Day 35 # of Neonates	Day 35 Initials	Day 42 Surviving #	Day 42 # of Neonates	Day 42 Initials	Number of F	Number of M	Initials	# weighed	Initial Pan Weight	Final Pan Weight
41686	A	9	8	JG	9	13	J	6	3	J	9	25.80	29.4~~8~~20 JG
Control	B	10	4	JG	9	2	J	2	7	J	9	25.91	28.38
	C	10	12	JG	9	12	J	5	4	J	9	25.21	28.08
	D	10	4	JG	9	5	J	4	5	J	9	25.92	28.71
	E	10	9	JG	10	6	J	4	6	J	10	25.22	28.33
	F	9	22	JG	9	0	J	5	4	J	9	25.23	28.34
	G	6	4	JG	6	16	J	4	2	J	6	24.73	27.00
	H	9	3	JG	9	14	J	6	3	J	9	25.80	28.67
41687	A	10	4	JG	10	7	J	J ~~5~~4	6	J	10	24.68	28.17
SD-23	B	10	14	JG	10	25	J	7	3	J	10	25.06	28.67
	C	10	2	JG	10	5	J	5	5	J	10	24.66	27.98
	D	9	8	JG	9	15	J	4	5	J	9	25.28	29.30
	E	9	15	JG	8	14	J	6	2	J	8	24.08	27.17
	F	10	5	JG	10	8	J	6	4	J	10	24.46	27.44
	G	10	5	JG	10	17	J	4	6	J	10	23.84	27.25
	H	9	6	JG	9	8	J	2	7	J	9	24.98	28.82
41688	A	10	8	JG	10	9	J	5	5	J	10	25.66	28.81
SD-04	B	10	4	JG	9	2	J	2	7	J	9	24.71	27.68
	C	10	3	JG	10	5	J	6	4	J	10	24.52	27.51
	D	11	9	JG	10	10	J	6	4	J	10	25.06	28.28
	E	10	10	JG	10	12	J	8	2	J	10	25.92	29.43
	F	9	9	JG	9	6	J	7	2	J	9	25.70	28.88
	G	10	1	JG	10	7	J	5	5	J	10	24.55	27.42
	H	10	9	JG	10	9	J	5	5	J	10	25.05	28.70
41689	A	0	0	JG	0	0	—	-	-	-	—	24.61	—
SD-18	B	0	0	JG	0	0	—	-	-	-	—	24.87	—
	C	0	0	JG	0	0	—	-	-	-	—	24.87	—
	D	0	0	JG	0	0	—	-	-	-	—	24.95	—
	E	1	0	JG	1	0	J	1	0	J	1	24.96	25.36
	F	0	0	JG	0	0	—	-	-	-	—	25.28	—
	G	0	0	JG	0	0	—	-	-	-	—	24.66	—
	H	1	0	JG	0	0	J	-	-	-	—	25.02	—

11/24/11

NOTES:

Date/Init (Initial Pan Weights):
11-29-11 JG
IN (Date/Time/Temp/Init): 82°C 12-1-11 1645 JG
OUT (Date/Time/Temp/Init): JG 12-2-11 1430 82°C

Aquatec Biological Sciences, Inc.

Reviewed by: JT Date: 12/15/11

SDG: 12885

Project: 11050

R2-0001745

Project: TRC SMC 002 Supplemental Test ID: **63173**

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

SEDIMENT TEST DATA:

Sample Number	Rep.	Day 35 Surviving #	Day 35 # of Neonates	Day 35 Initials	Day 42 Surviving #	Day 42 # of Neonates	Day 42 Initials	Number of F	Number of M	Initials	# weighed	Initial Pan Weight	Final Pan Weight
41690 SD-15	A	7	3	JG	7	0	J	2	5	J	7	24.36	27.33
	B	10	5	JG	9	19	J	4	5	J	9	24.14	27.06
	C	8	11	JG	7	17	J	4	3	J	7	24.61	27.27
	D	8	7	JG	7	4	J	3	4	J	7	24.92	28.02
	E	9	4	JG	9	3	J	5	4	J	9	24.63	27.93
	F	9	0	JG	9	19	J	7	2	J	9	24.95	28.54
	G	10	4	JG	10	19	J	6	4	J	10	25.33	28.29
	H	9	6	JG	9	9	J	5	4	J	9	24.75	27.84
41739 SD-31	A	10	4	JG	10	11	JG	5	5	J	10	25.75	28.~~36~~88 JG
	B	10	9	JG	10	2	JG	5	5	J	10	24.47	27.79
	C	9	2	JG	9	2	JG	2	7	J	9	24.50	27.49
	D	10	13	JG	9	7	JG	7	2	J	9	25.47	28.24
	E	10	9	JG	9	3	JG	5	4	J	9	24.77	27.69
	F	9	19	JG	8	2	JG	4	4	J	8	24.49	27.23
	G	9	11	JG	8	5	JG	3	5	J	8	24.99	28.07
	H	10	7	JG	10	0	JG	3	7	J	10	25.43	28.45
41740 SD-35A	A	10	9	J	9	2	JG	4	5	J	9	25.05	28.26
	B	9	5	J	8	2	JG	3	5	J	8	26.18	29.19
	C	10	10	J	JG ~~9~~ 10	8	JG	5	4	J ②	JG ~~10~~ 9	24.93	27.96
	D	9	4	J	8	8	JG	3	5	J	8	27.77	30.72
	E	9	7	J	5	8	JG	1	4	J	5	25.15	26.98
	F	9	18	J	8	9	JG	5	3	J	8	25.18	28.10
	G	9	8	JG	8	16	JG	6	2	J	8	25.28	27.83
	H	10	15	JG	9	8	JG	6	3	J	9	24.75	27.64
41741 SD-13	A	10	11	J	10	10	JG	5	5	JG ~~10~~	10	25.67	28.~~35~~95 JG
	B	9	5	J	9	2	JG	2	7	~~9~~ JG	9	26.09	29.70
	C	10	5 ①	J	10	4	JG	5	5	~~10~~ JG	10	25.41	28.74
	D	10	17	J	10	14	JG	7	3	JG	10	24.95	27.82
	E	10	J ~~9~~ 10	J	10	5	JG	6	4	JG	10	25.95	29.22
	F	10	0	J	10	6	JG	2	8	J	10	26.06	30.26
	G	9	6	J	9	6	JG	3	6	J	9	24.08	27.65
	H	10	0	J	9	7	JG	2	7	J	9	25.53	28.92

11/24/11

NOTES: 1 dead in 41690C, 11-24-11 JG
① 5 live, 1 dead neonate (not included in count)
② Only 9 found in cup. J use data as written. It is possible that 1 amphipod was lost during transfer for sex ID.

Date/Init (Initial Pan Weights): 11-29-11 JG
IN (Date/Time/Temp/Init): JG 12-1-11 1645 82°C
OUT (Date/Time/Temp/Init): JG 12-2-11 1430 82°C

Aquatec Biological Sciences, Inc.
Reviewed by: ________ Date: 12/15/11

SDG: 12885
Project: 11050

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

SEDIMENT TEST DATA:

Sample Number	Rep.	Day 35 Surviving #	Day 35 # of Neonates	Day 35 Initials	Day 42 Surviving #	Day 42 # of Neonates	Day 42 Initials	Number of F	Number of M	Initials	# weighed	Initial Pan Weight	Final Pan Weight
41742	A	8	0	J	8	3	JG	3	5	8 JG	8	24.35	27.26
SD-10	B	9	17	J	9	11	JG	7	2	9	9	25.10	28.28
	C	9	3	J	9	15	JG	7	2	9	9	24.38	27.09
	D	9	0	J	9	8	JG	3	6	9	9	24.61	27.82
	E	10	0	J	10	5	JG	4	6	10	10	25.87	28.85
	F	6	0	J	5	14	JG	2	3	5	5	25.39	27.50
	G	9	4	J	9	10	JG	6	3	9	9	24.74	27.55
	H	8	0	J	8	6	JG	3	5	8	8	24.78	27.64

11/24/11

NOTES:

Date/Init (Initial Pan Weights): 11-29-11 JG
IN (Date/Time/Temp/Init): JG 12-1-11 1645 82°C
OUT (Date/Time/Temp/Init): JG 12-2-11 1430 82°C

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ORGANISM HOLDING AND ACCLIMATION

Species: *Hyalella azteca*
Supplier: ARO
Condition: Normal

Date Received: 10/19/11
Age of Organisms: hatch 11-12-11
Culture ID: 101911HA

Acclimation / Holding Procedures: Transfer to holding culture boxes, add laboratory water. Acclimate to water to be used for testing (sediment overlying water formulation). Aerate lightly. Water change at least once (50 %) every two days.

Daily Feeding: 1:1 mix of Selenastrum / YCT, 1-3 mL (Maintain hint of green algal coloration on culture box bottom). Also add a pinch of ground Tetrafin. Do not allow excess food to accumulate.

Date	Fed	Temp.	pH	D.O.	Cond.	Condition	Water Change	Initials
10/19/11	YC	18.9°C	7.2	8.7	818	50% water change w/ sed recon.	→	JG
10/20/11	YC	22.4	7.1	7.5	494	Normal	50% w/ Sed. Recon.	JG
__/__/__								
__/__/__								
__/__/__								

N = Normal, appear healthy. Record # dead if any observed.

Hyalella azteca Initial Dry Weight

Replicate	No. of Org. weighed	Initial Pan weight (mg)	Final Pan weight (mg)	Initial Average wt. (mg)
1	10	23.08	23.26	0.018
2	10	23.84	24.02	0.018
3	10	23.93	24.12	0.019
4	10	24.30	24.47	0.017
5	10	23.44	23.62	0.018
6	10	24.20	24.41	0.021
7	10	23.27	23.40	0.013
8	10	23.28	23.46	0.018
	Initials	JG	JG	
	Date	10-20-11	10-21-11	

IN/OUT of Oven:

IN: Date/Time/Initials/Temp. 78°C
10-20-11 1500 JG

OUT: Date/Time/Initials/Temp. 79°C
10-21-11 1540 JG

Aquatic Research Organisms

DATA SHEET

I. Organism History

Species Hyalella azteca

Source: Lab reared X Hatchery reared ____ Field collected ____

Hatch date 10/12/11 Receipt date ____

Lot number 10 12 11 HA Strain ARO

Brood origination US FWS MO

II. Water Quality

Temperature 24 °C Salinity — ppt D.O. >AT ppm

pH 7.4 su Hardness ≈120 ppm Alkalinity ≈140 ppm

III. Culture Conditions

Received: 10-19-11

Freshwater x Saltwater ____ Other ____

Temp=18.9°C

Recirculating ____ Flow through ____ Static renewal x

pH=7.2

DIET: Flake food x Phytoplankton ____ Trout chow x

DO=8.7

Artemia ____ Rotifers ____ YCT ____ Other ____

Cond=818

Prophylactic treatments: ____

50% water-change w/ Sed Recon.

Comments: ____

Fed YC

IV. Shipping Information

Client: Aquatec VT # of Organisms 860

Carrier: FedEx Date shipped 10/18/11

Biologist: ____

PO BOX 1271 HAMPTON NH 03843-1271 (603) 926-1650 AROFISH@AOL.COM

Project: TRC SMC 002 Supplemental

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

CHEMISTRY DATA: Chemical analysis Date/Initials are noted on last page of Days 0 - 15 chemistry data sheets

Sample	Analysis	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
41686	pH	6.2	7.0			6.8		6.9		7.0			7.5		6.9		7.3
Control	DO	7.6	8.0			8.2		7.7		8.0			7.6		7.3		7.2
	Cond.	336	—			—		301		—			—		307		—
41687	pH	6.4	7.2			7.0		7.0		7.1			7.3		6.9		7.3
SD-23	DO	7.4	7.9			8.3		8.0		8.1			7.8		7.5		7.5
	Cond.	379	—			—		308		—			—		309		—
41688	pH	6.5	7.2			7.0		7.0		7.1			7.3		7.1		7.3
SD-04	DO	7.1	7.6			8.0		7.5		7.9			7.6		7.1		7.3
	Cond.	404	—			—		309		—			—		321		—
41689	pH	6.4	7.1			7.0		6.9		7.0			7.1		7.1		7.1
SD-18	DO	6.8	7.5			8.1		7.4		7.9			7.8		7.0		7.2
	Cond.	369	—			—		306		—			—		308		—
41690	pH	7.0	7.3			7.2		7.0		7.1			7.2		7.1		7.2
SD-15	DO	7.1	7.4			8.0		7.4		7.9			8.0		7.1		7.5
	Cond.	481	—			—		344		—			—		319		—
41739	pH	6.5	7.1			7.0		7.0		7.1			7.1		7.0		7.1
SD-31	DO	7.4	7.9			8.5		7.6		8.2			8.1		7.4		7.7
	Cond.	318	—			—		291		—			—		295		—
41740	pH	6.4	6.9			6.9		6.8		6.9			7.0		7.0		7.1
SD-35A	DO	7.5	7.8			8.1		7.5		8.1			8.2		7.2		7.5
	Cond.	312	—			—		287		—			—		295		—
41741	pH	6.6	7.0			7.0		6.9		7.0			7.0		7.0		7.3
SD-13	DO	7.1	7.9			8.4		7.4		8.2			8.3		7.2		8.3
	Cond.	390	—			—		318		—			—		310		—
41742	pH	6.5	6.9			7.0		6.8		6.9			7.1		7.0		7.3
SD-10	DO	7.0	7.8			8.1		7.1		7.9			7.8		7.0		7.3
	Cond.	358	—			—		302		—			—		303		—
2011	Date	10/20	10/21			10/24		10/26		10/28			10/31		11/2		11/4
	Initials	JG	JG			KK		JG		JG			J		JG		KK

Aquatec Biological Sciences, Inc.
Reviewed by: ____ Date: 12/15/11

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SDG: 12885
Project: 11050

R2-0001750

Project: TRC SMC 002 Supplemental

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

CHEMISTRY DATA: Chemical analysis Date/Initials are noted on last page of Days 16 - 31 chemistry data sheets

Sample	Analysis	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
41686 Control	pH			7.0		7.2		7.3			7.0		7.2		7.3		
	DO			6.9		7.3		7.2			7.2		7.2		8.5		
	Cond.			—		347		—			—		311		—		
41687 SD-23	pH			7.1		7.3		7.4			7.2		7.2		7.3		
	DO			7.2		7.0		7.1			7.3		7.6		8.6		
	Cond.			—		353		—			—		315		—		
41688 SD-04	pH			7.1		7.2		7.3			7.0		7.1		7.2		
	DO			7.2		7.1		7.2			7.3		7.2		8.5		
	Cond.			—		329		—			—		308		—		
41689 SD-18	pH			7.1		7.2		7.3			7.0		7.0		7.2		
	DO			7.1		7.2		7.3			7.3		7.2		8.6		
	Cond.			—		347		—			—		309		—		
41690 SD-15	pH			7.1		7.3		7.3			7.3		7.3		7.4		
	DO			7.4		7.2		7.3			7.6		7.3		8.6		
	Cond.			—		357		—			—		315		—		
41739 SD-31	pH			7.1		7.1		7.2			7.1		7.1		7.3		
	DO			7.5		7.3		7.5			7.7		7.6		8.5		
	Cond.			—		337		—			—		299		—		
41740 SD-35A	pH			7.1		7.0		7.2			7.0		7.0		7.2		
	DO			7.3		7.2		7.4			7.3		7.3		8.5		
	Cond.			—		329		—			—		294		—		
41741 SD-13	pH			7.1		7.0		7.1			7.1		7.0		7.3		
	DO			7.3		7.2		7.5			7.6		7.4		8.6		
	Cond.			—		350		—			—		310		—		
41742 SD-10	pH			7.3		7.2		7.2			7.2		7.1		7.3		
	DO			7.2		6.9		7.1			7.4		7.1		8.4		
	Cond.			—		352		—			—		313		—		
	Date			11/7		11/9		11/11			11/14		11/16		11/18		
	Initials			KK		JG		JG			KK		KK		JG		

Aquatec Biological Sciences, Inc.

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Reviewed by: JG Date: 12/15/11

SDG: 12885
Project: 11050

R2-0001751

Project: TRC SMC 002 Supplemental

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

CHEMISTRY DATA: Chemical analysis Date/Initials are noted on last page of Days 32 - 42 chemistry data sheets

Sample	Analysis	32	33	34	35	36	37	38	39	40	41	42
41686 Control	pH	7.0		7.2		7.1			7.2		6.9	
	DO	8.2		7.6		8.0			8.2		8.1	
	Cond.	—		326		—			—		316	
41687 SD-23	pH	7.1		7.1		7.2			7.3		6.8	
	DO	8.3		7.7		8.0			7.9		8.0	
	Cond.	—		324		—			—		318	
41688 SD-04	pH	7.1		7.1		7.1			7.3		6.8	
	DO	8.2		7.5		7.9			8.0		8.0	
	Cond.	—		323		—			—		321	
41689 SD-18	pH	7.2		7.1		7.2			7.3		6.9	
	DO	8.4		7.6		8.1			8.0		8.1	
	Cond.	—		330		—			—		322	
41690 SD-15	pH	7.2		7.2		7.2			7.3		6.8	
	DO	8.4		7.7		8.0			8.0		8.1	
	Cond.	—		320		—			—		320	
41739 SD-31	pH	7.3		7.2		7.2			7.4		6.9	
	DO	8.7		7.8		8.2			8.0		8.0	
	Cond.	—		331		—			—		321	
41740 SD-35A	pH	7.3		7.2		7.2			7.4		6.9	
	DO	8.3		7.6		8.2			7.9		7.8	
	Cond.	—		327		—			—		316	
41741 SD-13	pH	7.3		7.2		7.3			7.4		6.9	
	DO	8.4		7.6		8.2			8.0		7.9	
	Cond.	—		327		—			—		319	
41742 SD-10	pH	7.3		7.2		7.2			7.4		6.8	
	DO	8.3		7.5		8.1			8.0		7.8	
	Cond.	—		326		—			—		318	
	Date	11/21		11/23		11/25			11/28		11/30	
	Initials	KR		J		JG			KR		JG	

Aquatec Biological Sciences, Inc.
Reviewed by: J Date: 12/15/11

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SDG: 12885
Project: 11050

R2-0001752

Aquatec Biological Sciences

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SDG: 12885
Project: 11050

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E-Mail: sheim@trcsolutions.

ALKALINITY AND HARDNESS

Sample ID:			Sample Date:	Alkalinity: (mg/L)	Hardness: (mg/L)
41686	Control	Ha 42 Day 0	10/20/2011	52.0	82.0
41687	SD-23	Ha 42 Day 0	10/20/2011	56.0	86.0
41688	SD-04	Ha 42 Day 0	10/20/2011	64.0	84.0
41689	SD-18	Ha 42 Day 0	10/20/2011	52.0	76.0
41690	SD-15	Ha 42 Day 0	10/20/2011	92.0	70.0
41739	SD-31	Ha 42 Day 0	10/20/2011	44.0	70.0
41740	SD-35A	Ha 42 Day 0	10/20/2011	40.0	70.0
41741	SD-13	Ha 42 Day 0	10/20/2011	60.0	68.0
41742	SD-10	Ha 42 Day 0	10/20/2011	52.0	74.0
41686	Control	Ha 42 Day 27	11/16/2011	60.0	82.0
41687	SD-23	Ha 42 Day 27	11/16/2011	60.0	84.0
41688	SD-04	Ha 42 Day 27	11/16/2011	56.0	80.0
41689	SD-18	Ha 42 Day 27	11/16/2011	52.0	78.0
41690	SD-15	Ha 42 Day 27	11/16/2011	64.0	82.0
41739	SD-31	Ha 42 Day 27	11/16/2011	52.0	74.0
41740	SD-35A	Ha 42 Day 27	11/16/2011	48.0	72.0
41741	SD-13	Ha 42 Day 27	11/16/2011	60.0	76.0
41742	SD-10	Ha 42 Day 27	11/16/2011	60.0	80.0
41686	Control	Ha 42 Day 35	11/23/2011	64.0	88.0
41686	Control	Ha 42 Day 41	11/30/2011	60.0	88.0
41687	SD-23	Ha 42 Day 41	11/30/2011	60.0	86.0
41688	SD-04	Ha 42 Day 41	11/30/2011	60.0	88.0
41689	SD-18	Ha 42 Day 41	11/30/2011	60.0	90.0
41690	SD-15	Ha 42 Day 41	11/30/2011	60.0	88.0
41739	SD-31	Ha 42 Day 41	11/30/2011	64.0	88.0
41740	SD-35A	Ha 42 Day 41	11/30/2011	60.0	84.0
41741	SD-13	Ha 42 Day 41	11/30/2011	60.0	86.0
41742	SD-10	Ha 42 Day 41	11/30/2011	60.0	84.0

Reviewed by: Date: 12/21/11

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SDG: 12885
Project: 11050

AMMONIA ANALYSIS REPORT

Project: TRC SMC 002 Supplemental

100.4 **Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test**

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

Sample	Pore Water (mg/L)	Overlying Water (mg/L)		
	10/19/2011	10/20/2011	11/16/2011	11/30/2011
41686 - **Control**	2.0	0.3	0.4	0.3
41687 - **SD-23**	2.9	0.6	0.4	0.3
41688 - **SD-04**	5.0	0.5	0.4	0.2
41689 - **SD-18**	1.0	0.3	0.3	0.2
41690 - **SD-15**	0.7	0.3	0.4	0.4
41739 - **SD-31**	1.4	0.5	0.4	0.3
41740 - **SD-35A**	1.4	0.3	0.4	0.4
41741 - **SD-13**	0.8	0.3	0.4	0.4
41742 - **SD-10**	12.1	1.6	0.4	0.3

BD- Indicates a concentration value below the reporting limit (<0.1).

Reviewed by: [signature] Date: 12/15/11

Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Aquatec Biological Sciences

Channel #: 7

TEMPERATURE LOG (°C)

Client: TRC
Project: TRC SMC 002 Supplemental
Project #: 11050
SDG: 12885
Species: *Hyalella azteca*

DAY	Hour of the Day																								Daily		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	MIN	MAX
10/20/2011																	22.7	22.8	22.7	22.7	22.6	22.9	23.0	22.6	22.8	22.6	23.0
10/21/2011	22.5	22.8	22.7	22.7	22.6	22.8	22.9	22.6	22.7	22.6	22.7	22.6	22.3	22.6	22.5	22.7	22.5	22.7	22.6	22.8	22.6	22.7	22.7	22.7	22.7	22.3	22.9
10/22/2011	22.5	22.8	22.8	22.8	22.6	22.7	22.8	22.7	22.8	23.3	23.3	23.3	23.2	23.3	23.3	23.4	23.3	23.5	23.6	23.5	23.6	23.7	23.6	23.3	23.2	22.5	23.7
10/23/2011	23.1	23.5	23.6	23.6	23.2	23.6	23.6	23.3	23.6	23.5	23.7	23.6	23.0	23.2	23.3	23.2	23.7	23.7	23.8	23.3	23.2	23.5	23.5	23.3	23.4	23.0	23.8
10/24/2011	23.1	23.3	23.2	23.3	23.7	23.5	23.5	23.6	23.6	23.4	23.5	23.5	23.5	23.3	23.7	23.9	23.5	23.5	23.7	23.6	23.6	23.7	23.4	23.4	23.5	23.1	23.9
10/25/2011	23.0	23.7	23.8	23.7	23.5	23.6	23.8	23.9	23.5	23.5	23.8	23.8	23.2	23.7	24.0	23.5	23.7	22.7	23.1	23.1	23.3	23.2	22.8	23.0	23.5	22.7	24.0
10/26/2011	23.0	22.7	23.1	23.5	23.3	23.1	23.1	23.1	23.5	23.0	23.0	23.2	22.7	23.3	23.1	22.9	23.4	22.8	23.1	23.5	23.1	23.1	23.2	23.5	23.1	22.7	23.5
10/27/2011	22.5	23.2	23.2	22.7	23.1	23.0	23.1	23.2	23.1	22.7	23.0	23.0	22.8	22.7	23.2	23.2	22.9	23.2	23.3	23.2	22.9	23.1	23.2	23.2	23.0	22.5	23.3
10/28/2011	22.5	23.2	23.2	22.8	23.1	23.2	22.7	22.8	23.0	23.2	23.2	22.8	22.5	22.8	23.5	22.8	23.1	23.3	23.1	23.2	23.2	23.0	23.2	23.2	23.0	22.5	23.5
10/29/2011	22.5	23.0	23.6	22.7	22.9	23.1	23.1	23.0	23.2	23.3	23.1	23.0	22.2	23.3	23.2	22.7	22.8	23.3	23.1	22.7	22.8	22.9	22.9	23.0	23.0	22.2	23.6
10/30/2011	22.5	22.7	23.0	23.3	23.0	22.6	23.1	23.1	23.1	23.2	23.1	22.9	22.4	23.0	23.3	22.9	23.0	23.3	22.8	23.3	23.0	23.1	23.4	23.2	23.0	22.4	23.4
10/31/2011	22.5	22.9	23.2	23.1	22.8	23.3	23.4	22.7	22.9	23.2	23.3	23.2	22.4	23.2	23.3	22.7	23.2	23.2	22.8	23.1	23.3	23.0	22.9	22.8	23.0	22.4	23.4
11/01/2011	22.5	23.3	23.4	22.8	22.9	23.5	23.0	23.0	23.3	23.2	23.1	22.7	22.6	23.2	23.0	22.9	23.1	23.3	23.1	23.3	22.8	23.0	23.1	23.3	23.1	22.5	23.5
87 11/02/2011	22.8	23.0	22.8	22.7	22.8	23.2	23.2	23.2	23.2	23.1	23.2	23.3	22.5	22.8	23.2	23.0	22.8	22.8	23.1	23.5	23.0	23.0	23.1	22.8	23.0	22.5	23.5
11/03/2011	22.7	23.2	23.3	23.1	22.9	23.2	23.6	22.7	23.0	22.7	22.9	23.1	22.8	23.3	22.8	22.9	23.0	23.0	23.2	23.5	22.8	23.0	23.3	22.9	23.0	22.7	23.6
11/04/2011	23.0	23.1	23.4	23.0	22.9	22.8	23.2	23.4	23.0	22.9	22.8	22.9	22.6	22.8	22.9	23.3	23.2	23.1	23.0	23.2	23.1	23.5	23.5	23.3	23.1	22.6	23.5
11/05/2011	23.3	23.1	22.9	23.7	23.3	23.2	23.1	23.0	23.6	23.5	23.4	22.9	22.7	23.3	23.3	23.2	22.8	23.0	23.5	22.8	23.0	23.3	23.3	22.9	23.2	22.7	23.7
11/06/2011	23.0	22.8	22.8	22.8	23.0	23.4	23.2	23.1	22.8	22.9	23.1	23.1	22.8	23.2	23.2	23.4	23.0	23.0	23.0	23.3	23.3	22.8	23.0	23.3	23.1	22.8	23.4
11/07/2011	23.3	23.5	23.1	23.2	23.1	22.8	22.9	23.1	23.3	23.1	23.0	22.9	22.9	22.9	23.2	23.2	23.1	23.1	22.9	22.9	23.3	23.3	22.7	22.9	23.1	22.7	23.5
11/08/2011	23.1	23.1	23.0	23.2	23.1	22.8	22.8	23.0	23.2	23.2	23.2	22.8	23.0	23.1	23.5	22.7	22.8	22.9	23.3	23.3	23.0	23.3	23.0	23.0	23.1	22.7	23.5
11/09/2011	23.2	22.9	23.3	23.2	22.9	22.9	23.2	23.3	22.8	22.9	23.2	23.3	22.7	23.0	23.5	22.7	22.9	23.3	22.7	23.3	23.0	22.8	23.5	22.8	23.1	22.7	23.5
11/10/2011	23.1	22.9	22.8	22.9	23.3	22.7	23.0	23.5	22.8	23.0	23.3	22.7	22.8	23.2	23.3	22.8	23.1	23.3	23.0	22.9	23.3	22.8	23.0	23.3	23.0	22.7	23.5
11/11/2011	22.8	22.6	22.9	23.0	23.4	23.1	22.9	23.2	23.0	23.1	23.4	23.0	23.0	22.4	23.1	23.3	23.0	23.3	23.3	22.8	23.3	23.2	22.9	23.5	23.1	22.4	23.5
11/12/2011	22.8	22.9	23.2	23.2	23.3	22.8	22.9	23.1	23.3	23.0	23.0	23.3	23.2	23.0	23.3	22.9	23.0	23.0	23.1	23.5	22.8	22.8	23.1	23.2	23.1	22.8	23.5
11/13/2011	23.1	22.8	23.3	23.2	23.0	22.8	22.8	23.2	23.2	23.3	22.8	22.8	22.8	22.8	23.3	22.8	22.8	23.2	23.0	23.1	23.3	22.8	23.2	23.1	23.0	22.8	23.3
11/14/2011	22.9	23.2	23.4	22.8	23.1	23.3	22.9	23.2	23.3	23.0	23.0	23.0	23.2	23.1	23.4	22.8	23.3	23.2	22.8	23.0	23.5	22.8	23.1	23.3	23.1	22.8	23.5
11/15/2011	22.8	22.9	23.2	23.3	22.8	22.9	23.3	23.1	23.1	23.5	22.8	23.1	23.3	22.9	23.3	22.8	23.2	22.8	23.1	23.4	23.0	23.0	23.1	22.8	23.1	22.8	23.5
11/16/2011	22.8	23.1	23.2	23.4	22.8	23.0	23.0	23.3	23.1	22.7	23.0	23.2	23.1	23.0	23.3	22.9	23.0	23.3	23.3	22.8	23.1	23.3	22.9	23.0	23.1	22.7	23.4
11/17/2011	23.2	22.7	23.2	23.2	23.1	23.2	23.2	22.9	22.8	22.7	23.0	22.8	22.8	22.7	23.2	23.2	23.0	22.7	22.8	23.0	22.6	23.1	23.3	23.1	23.0	22.6	23.3
11/18/2011	22.8	22.9	23.1	23.2	23.2	23.3	22.8	23.1	22.6	23.0	23.1	23.1	22.7	22.8	22.8	22.8	23.1	23.2	23.2	22.8	23.0	23.0	22.9	23.1	23.0	22.6	23.3
11/19/2011	23.2	23.1	23.0	23.0	22.6	22.7	22.7	22.7	22.9	23.0	23.3	23.1	23.1	23.2	22.8	23.1	23.0	23.0	22.8	22.7	22.8	23.2	23.1	23.2	23.0	22.6	23.3
11/20/2011	23.1	23.0	23.1	23.2	23.2	22.7	22.9	23.2	23.2	23.0	22.8	22.7	23.0	23.0	23.0	22.8	22.8	23.2	22.7	23.1	23.3	22.8	23.0	23.3	23.0	22.7	23.3
11/21/2011	23.0	23.0	23.3	22.7	23.0	22.7	22.8	22.8	22.7	23.0	23.3	23.2	23.1	22.8	22.9	22.7	23.0	22.7	22.8	22.8	23.0	23.1	23.0	23.1	22.9	22.7	23.3
11/22/2011	23.0	23.0	23.1	22.8	23.1	23.3	22.9	23.0	23.0	22.9	23.0	22.7	22.8	22.4	22.9	23.0	22.9	22.9	22.8	23.0	22.8	22.9	23.0	23.1	22.9	22.4	23.3
11/23/2011	22.8	23.0	23.1	23.1	23.1	23.1	23.2	23.1	22.8	23.0	22.6	22.7	22.8	22.7	23.0	22.6	22.6	22.8	23.0	23.0	23.1	23.0	22.9	23.0	22.9	22.6	23.2

Reviewed by: J Date: 12/21/11.

R2-0001755

Aquatec Biological Sciences

Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Channel #: 7

TEMPERATURE LOG (^{o}C)

Client: TRC
Project: TRC SMC 002 Supplemental
Project #: 11050
SDG: 12885
Species: *Hyalella azteca*

	Hour of the Day																								Daily		
DAY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	**AVE**	**MIN**	**MAX**
11/24/2011	23.0	22.7	23.1	23.0	23.1	23.0	23.2	23.2	23.0	23.0	23.0	22.6	22.7	22.8	23.0	23.0	23.0	22.9	23.0	23.1	23.1	23.0	23.1	23.0	23.0	22.6	23.2
11/25/2011	23.1	23.2	22.9	22.9	22.8	23.0	23.0	22.8	22.8	22.7	22.8	23.3	23.2	22.6	23.0	22.7	23.1	23.1	23.1	23.1	22.8	22.7	23.0	23.1	23.0	22.6	23.3
11/26/2011	23.2	22.8	23.1	23.1	22.8	22.7	22.7	22.9	23.0	22.8	22.8	22.8	22.8	23.0	22.7	22.9	23.2	23.1	22.8	23.0	23.3	23.0	22.8	22.9	22.9	22.7	23.3
11/27/2011	23.1	23.2	23.1	23.1	23.0	23.0	23.1	23.0	22.9	23.1	22.7	22.7	22.8	23.2	23.1	23.1	23.0	22.8	22.8	23.1	23.1	23.0	22.7	22.8	23.0	22.7	23.2
11/28/2011	23.1	23.2	23.0	23.3	22.6	22.8	22.9	23.0	23.1	23.2	22.8	22.7	23.0	23.1	23.2	23.0	22.9	23.2	22.7	23.0	23.1	22.8	23.0	23.2	23.0	22.6	23.3
11/29/2011	23.0	23.1	23.1	23.1	23.0	23.0	23.1	22.8	22.8	22.8	23.1	23.2	23.1	22.9	23.1	22.8	23.0	22.8	23.0	23.1	22.7	23.0	22.8	23.1	23.0	22.7	23.2
11/30/2011	22.7	23.1	23.0	22.8	23.0	23.1	22.7	23.1	23.0	22.9	23.0	22.9	22.7	22.6	22.7	22.9	23.2	22.8	22.9	23.2	23.2	22.7	22.9	23.0	22.9	22.6	23.2
12/01/2011	23.0	23.1	23.1	23.1	22.8	23.0	22.9	23.1	23.2	23.1	22.7	22.7	22.6	22.8											22.9	22.6	23.2
Overall Test Temperature:																									**23.0**	**22.2**	**24.0**

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Reviewed by: ____ Date: 12/15/11.

Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Aquatec Biological Sciences

Channel #: 8

TEMPERATURE LOG (°C)

Client: TRC
Project: TRC SMC 002 Supplemental
Project #: 11050
SDG: 12885
Species: *Hyalella azteca*

	Hour of the Day																								Daily		
DAY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	MIN	MAX
10/20/2011																	23.1	23.2	23.3	23.3	23.4	23.1	23.5	23.1	23.2	23.1	23.5
10/21/2011	23.0	23.2	22.8	23.2	23.1	22.8	22.8	23.1	23.0	23.1	23.0	22.9	22.7	22.8	22.9	23.1	23.0	22.8	23.1	23.0	22.9	22.7	22.8	22.7	22.9	22.7	23.2
10/22/2011	22.8	23.0	22.8	22.8	22.8	22.8	22.7	23.1	23.2	22.9	22.8	22.7	22.7	23.0	22.7	22.5	22.3	23.1	23.0	23.3	23.3	22.8	23.3	23.3	22.9	22.3	23.3
10/23/2011	23.2	23.5	23.3	23.2	23.2	23.2	23.3	23.1	23.3	23.3	23.3	23.5	23.2	23.3	23.5	23.4	23.3	23.3	23.2	23.4	23.5	23.1	23.2	23.3	23.3	23.1	23.5
10/24/2011	23.2	23.2	23.0	23.1	22.8	22.8	23.0	22.9	23.1	23.3	23.3	23.1	23.1	23.5	23.0	23.1	23.1	23.0	23.1	23.0	23.2	23.1	23.2	23.2	23.1	22.8	23.5
10/25/2011	22.8	22.9	23.1	22.9	23.0	23.0	23.0	23.2	23.2	23.2	23.2	23.3	22.9	23.1	23.1	23.0	22.9	22.7	22.7	22.6	22.7	22.7	22.6	22.7	22.9	22.6	23.3
10/26/2011	22.7	23.0	22.7	22.7	22.6	22.8	22.9	22.8	23.0	23.0	23.0	22.7	22.6	22.9	22.9	22.9	22.8	22.8	22.7	22.8	23.0	23.1	23.0	22.7	22.8	22.6	23.1
10/27/2011	22.8	23.0	22.7	22.6	22.6	23.0	23.0	22.8	22.8	22.7	23.0	23.1	22.7	23.0	22.8	22.7	22.7	22.7	22.8	22.8	23.0	22.9	22.7	22.7	22.8	22.6	23.1
10/28/2011	22.8	22.9	23.0	23.0	22.8	22.8	22.7	22.8	22.6	22.8	22.8	22.8	22.7	22.8	22.9	23.1	23.0	22.9	23.0	23.2	23.2	23.2	23.3	23.3	22.9	22.6	23.3
10/29/2011	22.8	23.0	22.9	23.3	23.3	23.3	23.2	23.2	23.4	23.1	23.0	23.3	22.7	22.8	23.1	23.1	23.0	23.3	23.3	23.1	23.2	23.1	23.2	23.1	23.1	22.7	23.4
10/30/2011	23.1	23.1	22.8	23.0	23.0	23.1	23.0	23.0	23.1	23.2	23.1	23.3	22.8	23.1	23.4	23.3	23.5	23.5	23.3	23.3	23.3	23.1	23.1	23.0	23.1	22.8	23.5
10/31/2011	22.7	22.8	23.0	23.0	22.9	22.9	23.2	23.3	23.2	23.3	23.3	23.3	22.6	23.1	22.8	23.1	23.1	22.8	22.8	22.9	22.8	22.9	22.9	22.9	23.0	22.6	23.3
11/01/2011	22.9	23.0	23.1	23.2	23.0	23.1	23.0	23.0	23.2	23.1	23.3	23.2	22.7	22.8	22.8	23.0	22.8	23.2	23.0	23.2	23.2	23.4	23.3	23.5	23.1	22.7	23.5
11/02/2011	23.0	22.8	23.1	23.0	23.2	23.1	23.0	22.8	23.0	23.1	23.1	23.1	22.8	22.9	23.1	23.1	23.0	23.0	23.1	23.2	23.5	23.6	22.9	23.1	23.1	22.8	23.6
11/03/2011	22.9	23.1	23.0	23.1	23.2	23.1	23.3	23.2	23.2	23.1	23.2	23.1	22.9	23.2	23.1	23.2	23.3	23.6	23.1	23.3	24.0	23.1	23.5	23.6	23.2	22.9	24.0
11/04/2011	23.2	23.4	23.8	22.8	23.2	23.3	23.7	23.4	23.0	23.3	23.6	23.6	23.1	23.1	23.1	23.2	23.8	23.8	23.8	23.3	23.7	23.5	23.4	23.3	23.4	22.8	23.8
11/05/2011	23.4	24.0	23.5	23.4	23.2	23.2	23.1	23.9	23.6	23.5	23.6	23.5	23.0	23.7	23.9	23.0	23.3	23.3	23.6	23.6	23.5	23.0	23.2	23.3	23.4	23.0	24.0
11/06/2011	23.5	23.3	23.2	23.2	23.2	23.1	23.3	23.3	23.2	23.2	23.5	23.4	23.3	23.2	23.2	23.4	23.6	23.8	23.1	23.1	23.1	23.4	23.6	23.7	23.3	23.1	23.8
11/07/2011	23.5	23.6	23.7	23.4	23.3	23.4	23.0	23.1	23.2	23.3	23.4	23.7	24.0	23.2	23.7	24.1	23.1	23.2	23.8	23.1	23.3	23.7	23.7	23.2	23.4	23.0	24.1
11/08/2011	23.4	23.8	23.6	23.6	23.4	23.0	23.3	23.7	23.6	23.1	23.2	23.7	23.8	23.2	23.6	23.6	23.1	23.3	23.4	23.5	23.7	23.1	23.2	23.8	23.4	23.0	23.8
11/09/2011	23.4	23.1	23.4	23.4	23.4	23.6	23.7	23.1	23.2	23.3	23.6	23.3	23.1	23.3	23.6	23.6	23.6	23.2	23.5	23.6	23.2	23.3	23.7	23.1	23.4	23.1	23.7
11/10/2011	23.4	23.7	23.7	23.3	23.3	23.4	23.8	23.1	23.3	23.7	23.2	23.6	23.7	23.0	23.8	23.1	23.3	23.6	23.8	23.0	23.5	23.9	23.1	23.5	23.5	23.0	23.9
11/11/2011	23.7	23.1	23.5	23.6	23.7	23.1	23.3	23.2	23.3	23.5	23.6	23.7	23.7	23.0	23.2	23.4	23.5	23.7	23.7	23.2	23.1	23.1	23.2	23.5	23.4	23.0	23.7
11/12/2011	23.8	23.4	23.2	23.5	23.4	23.6	23.7	23.4	23.2	23.3	23.1	23.2	23.1	23.2	23.7	23.5	23.0	23.1	23.2	23.2	23.4	23.6	23.6	23.7	23.4	23.0	23.8
11/13/2011	23.8	23.7	23.6	23.4	23.7	23.6	23.6	23.0	23.1	23.1	23.2	23.2	23.2	23.3	23.6	23.7	23.7	23.7	23.8	23.6	23.3	23.3	23.4	23.5	23.5	23.0	23.8
11/14/2011	23.8	23.1	23.3	23.1	23.5	23.7	23.7	23.5	23.1	23.4	23.6	23.6	23.7	24.0	23.7	23.6	23.3	23.1	23.2	23.2	23.5	23.7	23.6	23.1	23.5	23.1	24.0
11/15/2011	23.4	23.6	23.5	23.7	23.3	23.3	23.3	23.5	23.7	23.2	23.3	23.6	23.9	23.1	23.3	23.4	23.7	23.7	23.8	23.3	23.2	23.4	23.7	23.7	23.5	23.1	23.9
11/16/2011	23.4	23.2	23.2	23.3	23.3	23.2	23.3	23.1	23.3	23.4	23.3	23.2	23.2	23.1	23.5	23.5	24.0	23.7	23.8	23.6	23.1	23.2	23.4	23.6	23.4	23.1	24.0
11/17/2011	23.8	23.2	23.2	23.2	23.3	23.5	23.4	23.4	23.4	23.3	23.3	23.1	23.0	23.3	23.1	23.6	23.1	23.2	23.2	23.1	23.2	23.4	23.5	23.5	23.3	23.0	23.8
11/18/2011	23.3	23.5	23.3	23.1	23.2	23.2	23.1	23.0	23.1	23.1	23.1	23.3	23.0	23.0	23.1	23.2	23.0	23.0	23.0	23.2	23.2	23.2	23.1	23.2	23.1	23.0	23.5
11/19/2011	23.0	23.1	23.4	23.4	23.2	23.1	23.0	23.1	23.1	23.0	23.1	23.3	23.2	23.1	23.3	23.2	23.1	23.3	23.1	23.0	23.1	23.2	23.1	23.4	23.2	23.0	23.4
11/20/2011	23.3	23.4	23.1	23.0	23.2	23.3	23.5	23.4	23.5	23.2	23.0	23.0	23.3	23.3	23.1	23.2	23.1	23.1	23.1	23.2	23.0	23.0	23.2	23.2	23.2	23.0	23.5
11/21/2011	23.1	23.3	23.2	23.3	23.1	23.0	23.3	23.0	23.1	22.9	23.1	23.0	23.0	23.2	22.8	23.2	23.2	23.0	23.2	23.2	23.1	23.1	23.2	23.1	23.1	22.8	23.3
11/22/2011	23.0	23.2	23.0	23.2	23.1	22.9	23.1	23.2	23.0	23.0	23.1	23.2	23.1	23.0	23.1	23.0	23.1	23.0	22.8	23.1	23.3	23.1	23.3	23.2	23.1	22.8	23.3
11/23/2011	23.1	23.1	23.0	23.0	23.0	23.0	23.2	23.0	23.1	23.0	23.1	23.4	23.1	23.0	23.1	23.4	23.3	23.1	23.0	23.2	23.2	23.0	23.3	23.2	23.1	23.0	23.4

Reviewed by: ST Date: 12/15/11

R2-0001757

Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Aquatec Biological Sciences

Channel #: 8

TEMPERATURE LOG (°C)

Client: TRC
Project: TRC SMC 002 Supplemental
Project #: 11050
SDG: 12885
Species: *Hyalella azteca*

	Hour of the Day																								Daily		
DAY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	**AVE**	**MIN**	**MAX**
11/24/2011	23.0	23.1	22.8	23.0	22.8	23.0	23.1	23.0	23.0	23.1	23.1	22.7	23.0	22.8	23.1	23.0	23.3	23.5	23.5	23.5	23.3	23.4	23.2	23.2	23.1	22.7	23.5
11/25/2011	23.2	23.1	23.1	23.1	23.3	23.0	23.0	23.0	23.2	23.3	23.2	22.9	23.1	23.2	23.3	23.2	23.3	23.5	23.3	23.3	23.2	23.1	23.1	23.4	23.2	22.9	23.5
11/26/2011	23.3	23.3	23.2	23.2	23.1	23.2	23.2	23.2	23.1	23.2	23.3	23.3	23.2	23.2	23.3	23.3	23.3	23.5	23.6	23.5	23.3	23.3	23.2	23.4	23.3	23.1	23.6
11/27/2011	23.3	23.3	23.1	23.3	23.5	23.2	23.5	23.2	23.5	23.3	23.1	23.3	23.5	23.2	23.2	23.5	23.2	23.4	23.2	23.2	23.5	23.6	23.3	23.3	23.3	23.1	23.6
11/28/2011	23.2	23.2	23.3	23.3	23.5	23.2	23.5	23.2	23.1	23.3	23.5	23.3	23.2	23.3	23.3	23.3	23.5	23.2	23.2	23.2	23.6	23.6	23.5	23.3	23.3	23.1	23.6
11/29/2011	23.5	23.3	23.1	23.4	23.3	23.3	23.2	23.3	23.2	23.2	23.2	23.5	23.3	23.3	23.5	23.4	23.2	23.3	23.3	23.3	23.4	23.3	23.3	23.6	23.3	23.1	23.6
11/30/2011	23.7	23.4	23.4	23.3	23.3	23.2	23.5	23.3	23.3	23.3	23.3	23.2	23.2	23.5	23.5	23.2	23.5	23.4	23.3	23.3	23.5	23.4	23.1	23.2	23.3	23.1	23.7
12/01/2011	23.5	23.2	23.1	23.2	23.4	23.1	23.3	23.3	23.2	23.2	23.3	23.1	23.5	23.3											23.3	23.1	23.5
																								Overall Test Temperature:	**23.2**	**22.3**	**24.1**

06

Reviewed by: J Date: 12/15/11

Aquatec Biological Sciences, Inc.
273 Commerce Street
Williston, VT 05495
Tel: (802) 860 - 1638 Fax: (802) 658 - 3189

TRC
Wannalancit Mills
650 Suffolk St
Lowell, MA 01854

Tel: (978) 656-3583
Fax: (978) 453-1995
E-Mail: sheim@trcsolutions.

SEDIMENT CHARACTERIZATION:

Sample Number	Client Sample ID	Sediment Characteristics	Pore Water pH	Organisms Present	Initial /Date
41686 Sieved: Y / N 0.5 Mesh size	Control	Fine & medium sand sieved in field	6.1	None seen	10/19/11
41687 Sieved: Y / N 1.0 Mesh size	SD-23	Medium sand with lots of detritus of fibrous material.	7.1	None seen	10/19/11
41688 Sieved: Y / N 1.0 Mesh size	SD-04	fine to medium sand with vegetative detritus and small stones.	6.8	None seen	
41689 Sieved: Y / N 1.0 Mesh size	SD-18	DARK Soft fine mud mixed in with a very high volume of vegetative material, very fluid	6.2	None seen	
41690 Sieved: Y / N 1.0 Mesh size	SD-15	DARK Soft fine fluid mud in with vegetative material, sticks	7.3	None seen	
41739 Sieved: Y / N 1.0 Mesh size	SD-31	DARK Cohesive sediment rich in organics, some clay-like material. Soft fibers	5.2	None seen	
41740 Sieved: Y / N 1.0 Mesh size	SD-35A	DARK Soft fluid sediment with high proportion of vegetative material, sticks.	5.0	None seen	
41741 Sieved: Y / N 1.0 Mesh size	SD-13	Brown fine soft sediment / fluid with vegetative material & sticks	6.3	None seen	
41742 Sieved: Y / N 1.0 Mesh size	SD-10	Brown medium sand w/ vegetative material, sticks	6.0	None seen	

Sediments loaded into test replicate beakers 10/19/11

Overlying water added 10/19/11

Aquatec Biological Sciences, Inc.
Reviewed by: ________ Date: 12/15/11

SDG: 12885
Project: 11050

R2-0001759

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

SEDIMENT MONITORING - NOTES

Date / Initial	SEDIMENT MONITORING - NOTES
11/2/11	Per telephone conversation with Scott Heim (TRC)
	These tests will be continued for 42 days
	(28 day sediment exposure, Days 28-42 water only)
	to generate reproduction data along with survival
	& growth on Day 42.
	We will set up four new reps for 28-day
	survival and growth only.

Project: TRC SMC 002 Supplemental 42 J **WEEK OF:** 10/16/11

100.4-28Ha Amphipod, H. azteca, ~~28~~-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

ACTIVITY / DAY

DAILY SEDIMENT MONITORING - CHECKLIST

AM	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): CART 1 SL 2 Probe 8 / CART 2 SL 2 Probe 7					23.9 22.9	22.7 22.8	22.9 22.8
Fill Reservoirs					✓	✓	✓
Delivery tubes in place					✓	✓	✓
Check water Supply					✓	✓	✓
Empty Waste Buckets					✓	✓	✓
Floater/~~Aeration~~* Check					—	✓	✓
Chems Collected / ok?					✓	✓	—

NOON	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?					✓	✓	✓
Syringes filing?					✓	✓	✓
Needles flowing?					✓	✓	✓
Drainage to Waste - ok?					✓	✓	✓
Feeding (Time/Init.)					1615 JG	1530 JG	1230 JG

PM	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): See Above					22.9 22.8	22.7 22.6	22.6 23.1
Fill Reservoirs				✓	✓	✓	✓
Delivery tubes in place				✓	✓	✓	✓
Check water Supply				✓	✓	✓	✓
Empty Waste Buckets				—	✓	✓	✓
Floater/~~Aeration~~* Check				—	✓	✓	✓
Date:				10-19-11	10-20-11	10-21-11	10-22-11
Initials:				JG / J	JG	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)				Loaded sediments into beakers. Added overlying water. JG-COUNTS JW-QC of COUNTS	Test START 16:15 J 10/20/11		

Aquatec Biological Sciences, Inc.
Reviewed by: J Date: 12/15/11

SDG: 12885
Project: 11050

R2-0001761

Project: TRC SMC 002 Supplemental 12/20 **WEEK OF:** 10/23/11

100.4-28Ha Amphipod, H. azteca, ~~28~~-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

DAILY SEDIMENT MONITORING - CHECKLIST

ACTIVITY / DAY

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s):	23.3 23.8	23.4 23.6	22.9 23.5	22.7 22.8	22.6 23.1	22.9 23.2	22.9 23.0
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	✓	✓
Chems Collected / ok?	—	✓	—	✓	—	✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	✓	✓	✓
Syringes filing?	✓	✓	✓	✓	✓	✓	✓
Needles flowing?	✓	✓	✓	✓	✓	✓	✓
Drainage to Waste - ok?	✓	✓	✓	✓	✓	✓	✓
Feeding (Time/Init.)	1340 KK	1430 KK	1520 JG	1535 JG	1400 JG	1345 JG	1325 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): See Above	22.9 23.8	23.1 23.6	22.8 24.1 (1)	22.9 23.0	22.8 22.9	23.1 23.0	23.0 23.1
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	✓	✓
Date:	10/23/11	10/24/11	10-25-11	10-26-11	10-27-11	10-28-11	10-29-11
Initials:	KK	KK	JG	JG	JG	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)			(1) Turned Cart 2 heater down. JG				

Aquatec Biological Sciences, Inc.
Reviewed by: JG Date: 12/15/11.

SDG: 12885
Project: 11050

R2-0001762

Project: TRC SMC 002 Supplemental KK JJ **WEEK OF:** 10/30/11

100.4-28Ha Amphipod, H. azteca, ~~28~~-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

ACTIVITY / DAY

DAILY SEDIMENT MONITORING - CHECKLIST

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s):	23.0 23.2	23.6 23.4	~~23.0~~ 22.8 22.9	22.7 22.8	22.9 22.9	23.1 22.9	23.3 23.2
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	✓	✓
Chems Collected / ok?	—	✓	—	✓	—	✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	✓	✓	✓
Syringes filing?	✓	✓	✓	✓	✓	✓	✓
Needles flowing?	✓	✓	✓	✓	✓	✓	✓
Drainage to Waste - ok?	✓	✓	✓	✓	✓	✓	✓
Feeding (Time/Init.)	1235 KK	15:40 JJ	1355 JG	1200 JG	1450 JG	1125 KK	1205 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): See Above	23.5 23.4	23.0 23.0	22.8 22.9	23.7 23.5	23.3 23.0	23.5 23.0	23.0 22.9
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	✓	✓
Date:	10/30/11	10/31/11	11-1-11	11-2-11	11-3-11	11-4-11	11-5-11
Initials:	KK	JJ	JG	JG	JG KK	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)							

Aquatec Biological Sciences, Inc.
Reviewed by: JJ Date: 12/15/11.

SDG: 12885
Project: 11050

R2-0001763

Project: TRC SMC 002 Supplemental **WEEK OF:** 11 / 6 / 11

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

ACTIVITY / DAY **DAILY SEDIMENT MONITORING - CHECKLIST**

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s):	23.5 23.2	23.5 23.2	23.1 23.0	23.1 22.9	23.2 23.0	23.3 23.1	23.2 22.9
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	✓	✓
Chems Collected / ok?	—	✓	—	✓	—	✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	✓	✓	✓
Syringes filing?	✓	✓	✓	✓	✓	✓	✓
Needles flowing?	✓	✓	✓	✓	✓	✓	✓
Drainage to Waste - ok?	✓	✓	✓	✓	✓	✓	✓
Feeding (Time/Init.)	1210 KK	1240 KK	1615 JG	1320 JG	1310 JG	1410 JG	1500 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): See Above	23.5 23.1	23.3 23.5	23.0 23.0	23.2 23.0	23.4 23.2	23.1 23.0	23.0 22.9
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	✓	✓
Date:	11/6/11	11/7/11	11-8-11	11-9-11	11-10-11	11-11-11	11-12-11
Initials:	KK	KK	JG	JG	JG	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)							

Aquatec Biological Sciences, Inc.
Reviewed by: [signature] Date: 12/05/11

SDG: 12885
Project: 11050

R2-0001764

Project: TRC SMC 002 Supplemental **WEEK OF:** 11/13/11

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

ACTIVITY / DAY — DAILY SEDIMENT MONITORING - CHECKLIST

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): / Probe #(s):	23.4 / 23.4	23.8 / 23.4	23.9 / 23.6	23.6 / 23.1	23.7 / 23.2	23.2 / 23.1	23.0 / 22.9
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/Aeration* Check	✓	✓	✓	✓	✓	✓	✓
Chems Collected / ok?	—	✓	—	✓	—	✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	✓	✓	✓
Syringes filing?	✓	✓	✓	✓	✓	✓	✓
Needles flowing?	✓	✓	✓	✓	✓	✓	✓
Drainage to Waste - ok?	✓	✓	✓	✓	✓	✓	✓
Feeding (Time/Init.)	1320 KK	15:30 JG	1540 KK	1400 JG	1530 JG	1305 JG	1255 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): / Probe #(s): See Above	23.5 / 23.2	23.5 / 23.0	23.7 / 23.7	23.4 / 23.2	23.0 / 22.9	23.0 / 23.1	23.1 / 23.3
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/Aeration* Check	✓	✓	✓	✓	✓	✓	✓
Date:	11/13/11	11/14/11	11/15/11	11/16/11	11/17/11	11-18-11	11-19-11
Initials:	KK	KK/JG	KK	KK	KK	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)					Day 28: Organisms recovered from sediment Water-only exposure begins. JG		

Aquatec Biological Sciences, Inc.
Reviewed by: JG Date: 12/15/11

SDG: 12885
Project: 11050

R2-0001765

Project: TRC SMC 002 Supplemental **WEEK OF:** 11 / 20 / 11

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

DAILY SEDIMENT MONITORING - CHECKLIST

ACTIVITY / DAY

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): / **Probe #(s):**	23.3 / 23.0	23.6 / 23.5	23.2 / 23.2	23.4 / 23.5	23.3 / 23.0	23.3 / 23.1	23.2 / 23.0
Fill Reservoirs	✓	✓	✓	✓	—	✓	✓
Delivery tubes in place	✓	✓	✓	✓	—	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/Aeration* Check	✓	✓	✓	✓	✓	✓	✓
Chems Collected / ok?	—	✓	—	✓	—	✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	1	✓	✓
Syringes filing?	✓	✓	✓	✓		✓	✓
Needles flowing?	✓	✓	✓	✓		✓	✓
Drainage to Waste - ok?	✓	✓	✓	✓		✓	✓
Feeding (Time/Init.)	12:15 KR	1405 KR	1445 JG	13:10 J	1150 JG	1145 JG	1200 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): / **Probe #(s): See Above**	23.3 / 23.0	23.5 / 23.1	23.0 / 22.9	23.9 / 23.2	22.2 / 21.6	23.0 / 22.9	23.3 / 23.0
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/Aeration* Check	✓	✓	✓	✓	✓	✓	✓
Date:	11/20/11	11/21/11	11-22-11	11/23/11	11-24-11	11-25-11	11-26-11
Initials:	KR	KR	JG	J	JG	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)					Day 35 Survival and Neonate Counts. 1 Beakers filled w/ new overlying water.		

Aquatec Biological Sciences, Inc.

Reviewed by: J Date: 12/15/11

SDG: 12885

Project: 11050

R2-0001766

Project: TRC SMC 002 Supplemental **WEEK OF:** 11 /27/ 11

100.4 Amphipod, H. azteca, 42-D Survival, Growth, and Reproduction Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-003

DAILY SEDIMENT MONITORING - CHECKLIST

ACTIVITY / DAY

AM	**SUNDAY**	**MONDAY**	**TUESDAY**	**WEDNESDAY**	**THURSDAY**	**FRIDAY**	**SATURDAY**
Temperature(s): **Probe #(s):**	23.5 23.0	23.7 23.5	23.4 23.2	23.6 23.2	23.2 23.3		
Fill Reservoirs	✓	✓	✓	✓			
Delivery tubes in place	✓	✓	✓	✓			
Check water Supply	✓	✓	✓	✓			
Empty Waste Buckets	✓	✓	✓	✓			
Floater/Aeration* Check	✓	✓	✓	✓			
Chems Collected / ok?	—	✓	—	✓	—		

NOON	**SUNDAY**	**MONDAY**	**TUESDAY**	**WEDNESDAY**	**THURSDAY**	**FRIDAY**	**SATURDAY**
Splitter box(s) filling?	✓	✓	✓	✓			
Syringes filing?	✓	✓	✓	✓			
Needles flowing?	✓	✓	✓	✓			
Drainage to Waste - ok?	✓	✓	✓	✓			
Feeding (Time/Init.)	1335 RL	1250 RL	1250 JG	1645 JG			

PM	**SUNDAY**	**MONDAY**	**TUESDAY**	**WEDNESDAY**	**THURSDAY**	**FRIDAY**	**SATURDAY**
Temperature(s): **Probe #(s): See Above**	23.5 23.3	23.7 23.5	23.4 22.9	~~23.9~~ 23.7 JG 23.5			
Fill Reservoirs	✓	✓	✓	✓			
Delivery tubes in place	✓	✓	✓	✓			
Check water Supply	✓	✓	✓	✓			
Empty Waste Buckets	✓	✓	✓	✓			
Floater/Aeration* Check	✓	✓	✓	✓			
Date:	11/27/11	11/28/11	11-29-11	11-30-11	12-1-11		
Initials:	RL	RL	JG	JG	JG		

	SUNDAY	**MONDAY**	**TUESDAY**	**WEDNESDAY**	**THURSDAY**	**FRIDAY**	**SATURDAY**
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)					Test ended: 12-1-11 1330		

Aquatec Biological Sciences, Inc.
Reviewed by: [signature] Date: 12/15/11

99

SDG: 12885
Project: 11050

R2-0001767

100.4-28Ha - Amphipod, H. azteca, 28-D Survival and Growth Test

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Test Run No:	11-0452-3455	**Test Type:**	Survival-Growth	**Analyst:**	
Start Date:	04 Nov-11 11:50	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Reconstituted Water
Ending Date:	02 Dec-11 10:45	**Species:**	Hyalella azteca	**Brine:**	
Duration:	27d 23h	**Source:**	Aquatic Research Organisms, NH	**Age:**	

Sample Code	Sample No	Sample Date	Receive Date	Sample Age	Client Name	Project
41686	15-3168-3101	19 Oct-11	19 Oct-11	16d 12h	TRC-2	
41687	10-2505-5517	06 Oct-11 13:30	08 Oct-11 09:45	28d 22h		
41688	15-8687-1003	06 Oct-11 17:50	08 Oct-11 09:45	28d 18h		
41689	20-0642-3130	07 Oct-11 10:45	08 Oct-11 09:45	28d 1h		
41690	00-4102-0288	07 Oct-11 14:00	08 Oct-11 09:45	27d 22h		
41739	18-5874-1769	10 Oct-11 13:30	15 Oct-11 10:00	24d 22h		
41740	03-9904-2725	11 Oct-11 09:45	15 Oct-11 10:00	24d 2h		
41741	12-3233-4825	12 Oct-11 08:00	15 Oct-11	23d 4h		
41742	11-5784-0090	12 Oct-11 13:45	15 Oct-11 10:00	22d 22h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
41686	Control Sediment	CONTROL	CONTROL		
41687	Sediment	SMC 002 Supplemental	SD-23		
41688	Sediment	SMC 002 Supplemental	SD-04		
41689	Sediment	SMC 002 Supplemental	SD-18		
41690	Sediment	SMC 002 Supplemental	SD-15		
41739	Sediment	SMC 002 Supplemental	SD-31		
41740	Sediment	SMC 002 Supplemental	SD-35A		
41741	Sediment	SMC 002 Supplemental	SD-13		
41742	Sediment	SMC 002 Supplemental	SD-10		

Test Acceptability

Analysis No	Endpoint	Attribute	Test Stat	Acceptabilty Limits	Overlap	Decision
02-6674-0747	Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes acceptability criteria
05-1141-1246	Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes acceptability criteria
10-0902-5416	Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes acceptability criteria
12-6877-0818	Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes acceptability criteria
13-9663-9845	Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes acceptability criteria
15-6455-5748	Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes acceptability criteria
16-2563-7666	Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes acceptability criteria
20-6736-3038	Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes acceptability criteria

Mean Dry Biomass-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.206	0.198	0.215	0.177	0.232	0.00416	0.0228	11.0%	0.0%
41687	4	0.248	0.216	0.28	0.152	0.341	0.0156	0.0855	34.5%	-20.1%
41688	4	0.275	0.259	0.29	0.218	0.316	0.00751	0.0412	15.0%	-33.2%
41689	4	0	0	0	0	0	0	0		100.0%
41690	4	0.228	0.22	0.236	0.198	0.244	0.0038	0.0208	9.14%	-10.4%
41739	4	0.239	0.223	0.256	0.176	0.274	0.008	0.0438	18.3%	-16.0%
41740	4	0.298	0.288	0.307	0.279	0.332	0.00453	0.0248	8.33%	-44.4%
41741	4	0.245	0.223	0.267	0.162	0.296	0.0108	0.0592	24.2%	-18.7%
41742	4	0.183	0.163	0.203	0.128	0.244	0.00979	0.0536	29.3%	11.4%

Hyalella azteca 28-d Survival and Growth Sediment Test **Aquatec Biological Sciences, Inc**

Mean Dry Weight-mg Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.237	0.233	0.241	0.227	0.253	0.00207	0.0113	4.79%	0.0%
41687	4	0.267	0.234	0.3	0.19	0.379	0.016	0.0878	32.9%	-12.7%
41688	4	0.283	0.265	0.3	0.218	0.319	0.00858	0.047	16.6%	-19.4%
41690	4	0.24	0.232	0.248	0.22	0.271	0.00407	0.0223	9.28%	-1.38%
41739	4	0.251	0.236	0.267	0.196	0.291	0.00764	0.0418	16.6%	-6.19%
41740	4	0.314	0.305	0.323	0.28	0.333	0.00456	0.025	7.95%	-32.5%
41741	4	0.249	0.23	0.268	0.18	0.296	0.0093	0.0509	20.4%	-5.27%
41742	4	0.197	0.178	0.215	0.149	0.244	0.00895	0.049	24.9%	17.0%

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.828	0.922	0.7	1	0.023	0.126	14.4%	0.0%
41687	4	0.95	0.928	0.972	0.9	1	0.0105	0.0577	6.08%	-8.57%
41688	4	0.975	0.956	0.994	0.9	1	0.00913	0.05	5.13%	-11.4%
41689	4	0	0	0	0	0	0	0		100.0%
41690	4	0.95	0.928	0.972	0.9	1	0.0105	0.0577	6.08%	-8.57%
41739	4	0.95	0.928	0.972	0.9	1	0.0105	0.0577	6.08%	-8.57%
41740	4	0.95	0.928	0.972	0.9	1	0.0105	0.0577	6.08%	-8.57%
41741	4	0.975	0.956	0.994	0.9	1	0.00913	0.05	5.13%	-11.4%
41742	4	0.925	0.889	0.961	0.8	1	0.0175	0.0957	10.4%	-5.71%

Hyalella azteca 28-d Survival and Growth Sediment Test **Aquatec Biological Sciences, Inc**

Mean Dry Biomass-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.232	0.212	0.204	0.177
41687	0.294	0.204	0.152	0.341
41688	0.287	0.316	0.278	0.218
41689	0	0	0	0
41690	0.244	0.198	0.229	0.24
41739	0.262	0.176	0.274	0.245
41740	0.28	0.3	0.279	0.332
41741	0.162	0.244	0.277	0.296
41742	0.244	0.128	0.21	0.149

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.232	0.236	0.227	0.253
41687	0.294	0.204	0.19	0.379
41688	0.319	0.316	0.278	0.218
41690	0.271	0.22	0.229	0.24
41739	0.291	0.196	0.274	0.245
41740	0.28	0.333	0.31	0.332
41741	0.18	0.244	0.277	0.296
41742	0.244	0.16	0.233	0.149

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41687	1	1	0.9	0.9
41688	0.9	1	1	1
41689	0	0	0	0
41690	0.9	0.9	1	1
41739	0.9	0.9	1	1
41740	1	0.9	0.9	1
41741	0.9	1	1	1
41742	1	0.8	0.9	1

CETIS Analytical Report

Report Date:	04 Dec-11 09:59 (p 1 of 1)
Link/Link Code:	18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	15-6455-5748	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:58	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					15.7%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41687	-1.06	1.94	0.192	0.8360	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0221403	0.0221403	1	1.13	0.3280	Non-Significant Effect
Error	0.1173731	0.0195622	6			
Total	0.1395134	0.0417025	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.42	47.5	0.3400	Equal Variances
Distribution	Shapiro-Wilk Normality	0.955		0.7570	Normal Distribution

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.827	0.923	0.7	1	0.0234	0.126	14.4%	0.0%
41687	4	0.95	0.928	0.972	0.9	1	0.0107	0.0577	6.08%	-8.57%

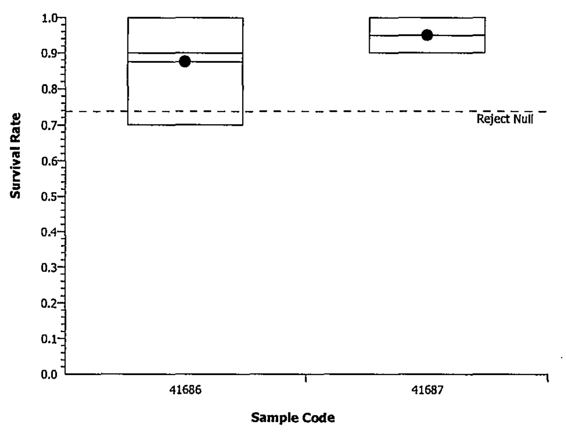
Angular (Corrected) Transformed Summary

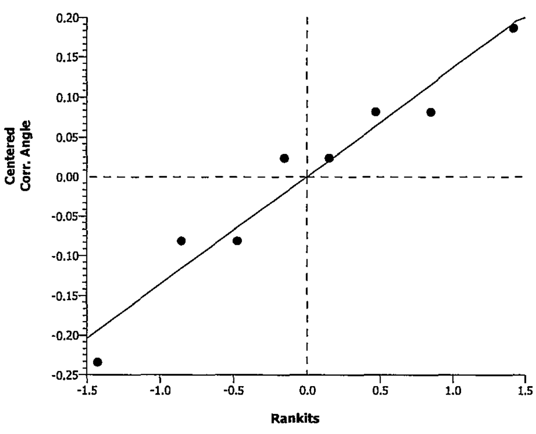
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	1.23	1.16	1.29	0.991	1.41	0.0323	0.174	14.2%	0.0%
41687	4	1.33	1.29	1.37	1.25	1.41	0.0175	0.0941	7.07%	-8.59%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41687	1	1	0.9	0.9

Graphics





CETIS Analytical Report

Report Date: 04 Dec-11 09:59 (p 1 of 1)
Link/Link Code: 18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 10-0902-5416 **Endpoint:** Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:58 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					15.1%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41688	-1.52	1.94	0.187	0.9100	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0426072	0.0426072	1	2.31	0.1790	Non-Significant Effect
Error	0.1107333	0.0184555	6			
Total	0.1533404	0.0610627	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.56	47.5	0.2450	Equal Variances
Distribution	Shapiro-Wilk Normality	0.869		0.1460	Normal Distribution

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.827	0.923	0.7	1	0.0234	0.126	14.4%	0.0%
41688	4	0.975	0.956	0.994	0.9	1	0.00928	0.05	5.13%	-11.4%

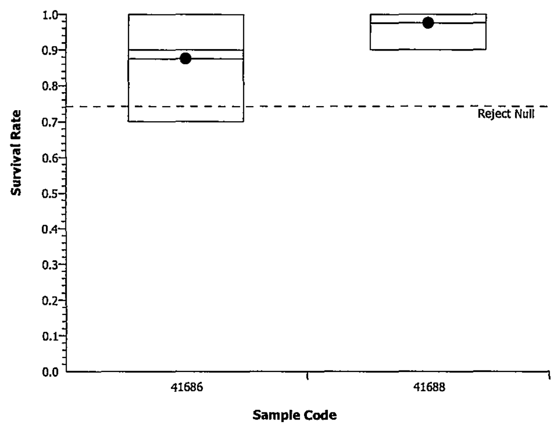
Angular (Corrected) Transformed Summary

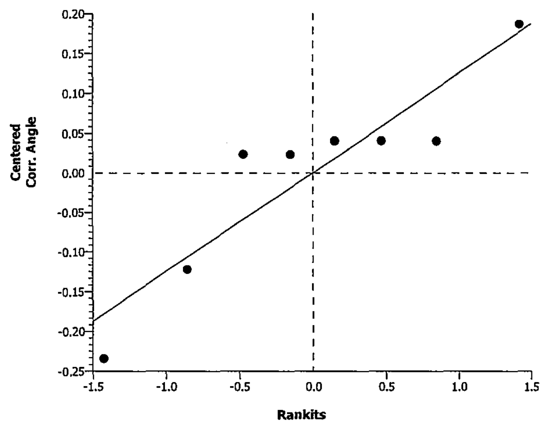
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	1.23	1.16	1.29	0.991	1.41	0.0323	0.174	14.2%	0.0%
41688	4	1.37	1.34	1.4	1.25	1.41	0.0151	0.0815	5.94%	-11.9%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41688	1	1	1	0.9

Graphics





CETIS Analytical Report

Report Date: 04 Dec-11 09:59 (p 1 of 1)
Link/Link Code: 18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 13-9663-9845 **Endpoint:** Survival Rate **CETIS Version:** CETISv1.6.4
Analyzed: 04 Dec-11 9:58 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					13.4%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41689	12.3	1.94	0.169	0.0000	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	2.274997	2.274997	1	150	0.0000	Significant Effect
Error	0.0908138	0.0151356	6			
Total	2.365811	2.290133	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Mod Levene Equality of Varianc	2.72	13.7	0.1500	Equal Variances
Distribution	Shapiro-Wilk Normality	0.781		0.0178	Normal Distribution

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.827	0.923	0.7	1	0.0234	0.126	14.4%	0.0%
41689	4	0	0	0	0	0	0	0		100.0%

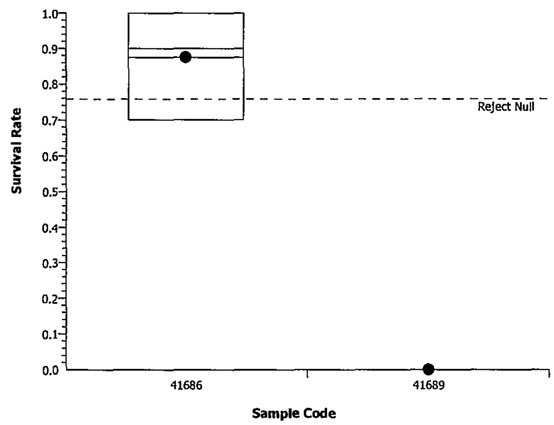
Angular (Corrected) Transformed Summary

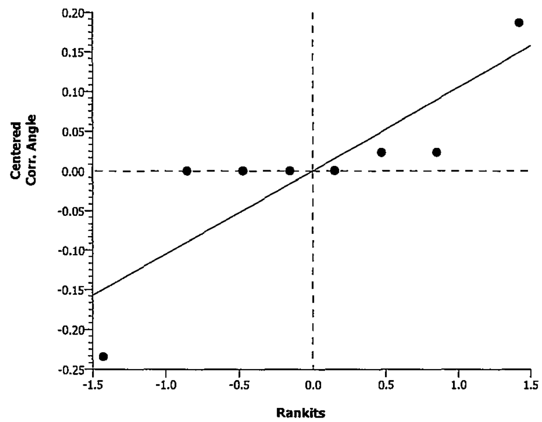
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	1.23	1.16	1.29	0.991	1.41	0.0323	0.174	14.2%	0.0%
41689	4	0.159	0.159	0.159	0.159	0.159	0	0	0.0%	87.0%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41689	0	0	0	0

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:59 (p 1 of 1)
Link/Link Code:	18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	20-6736-3038	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:58	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					15.7%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41690	-1.06	1.94	0.192	0.8360	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0221403	0.0221403	1	1.13	0.3280	Non-Significant Effect
Error	0.1173731	0.0195622	6			
Total	0.1395134	0.0417025	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.42	47.5	0.3400	Equal Variances
Distribution	Shapiro-Wilk Normality	0.955		0.7570	Normal Distribution

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.827	0.923	0.7	1	0.0234	0.126	14.4%	0.0%
41690	4	0.95	0.928	0.972	0.9	1	0.0107	0.0577	6.08%	-8.57%

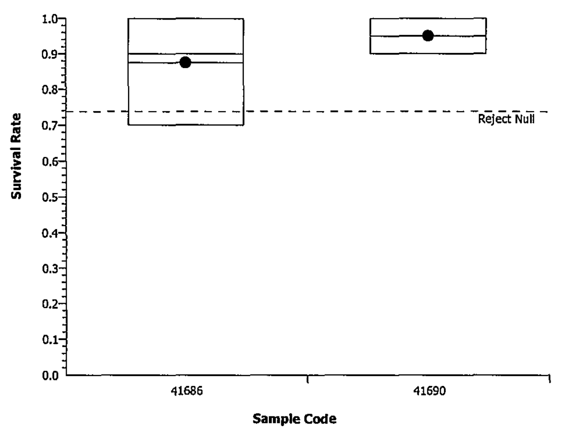
Angular (Corrected) Transformed Summary

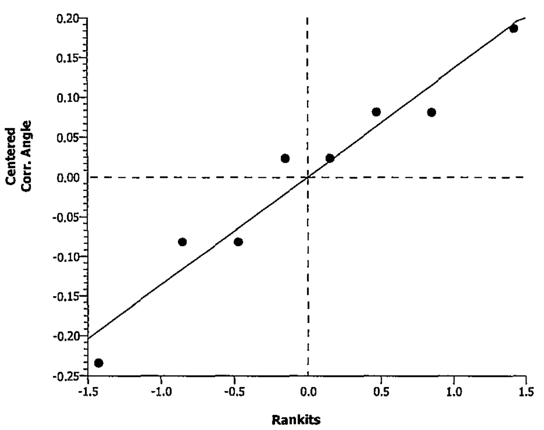
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	1.23	1.16	1.29	0.991	1.41	0.0323	0.174	14.2%	0.0%
41690	4	1.33	1.29	1.37	1.25	1.41	0.0175	0.0941	7.07%	-8.59%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41690	1	1	0.9	0.9

Graphics





Analyst:________ QA: T 12/16/11

R2-0001775

CETIS Analytical Report

Report Date:	04 Dec-11 09:59 (p 1 of 1)
Link/Link Code:	18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	16-2563-7666	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:58	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					15.7%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41739	-1.06	1.94	0.192	0.8360	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0221403	0.0221403	1	1.13	0.3280	Non-Significant Effect
Error	0.1173731	0.0195622	6			
Total	0.1395134	0.0417025	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.42	47.5	0.3400	Equal Variances
Distribution	Shapiro-Wilk Normality	0.955		0.7570	Normal Distribution

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.827	0.923	0.7	1	0.0234	0.126	14.4%	0.0%
41739	4	0.95	0.928	0.972	0.9	1	0.0107	0.0577	6.08%	-8.57%

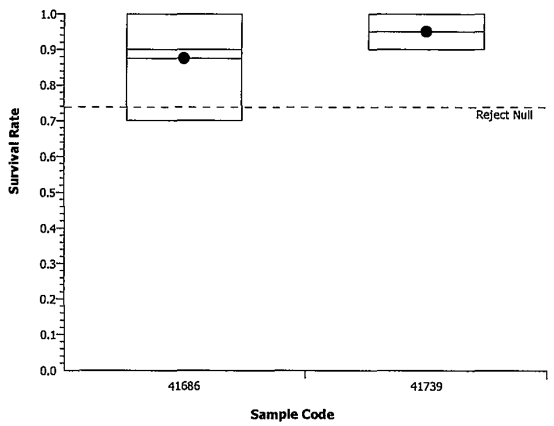
Angular (Corrected) Transformed Summary

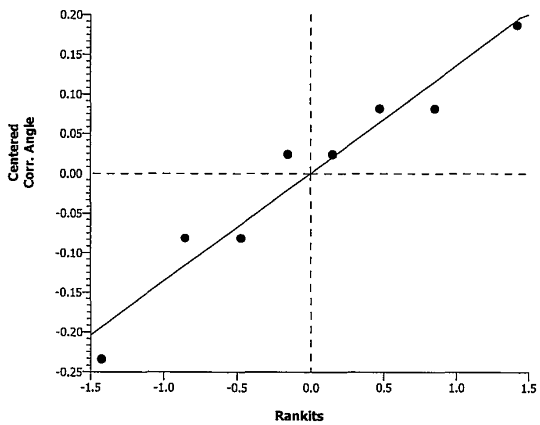
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	1.23	1.16	1.29	0.991	1.41	0.0323	0.174	14.2%	0.0%
41739	4	1.33	1.29	1.37	1.25	1.41	0.0175	0.0941	7.07%	-8.59%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41739	1	1	0.9	0.9

Graphics





CETIS Analytical Report

Report Date: 04 Dec-11 09:59 (p 1 of 1)
Link/Link Code: 18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	05-1141-1246	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:58	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					15.7%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41740	-1.06	1.94	0.192	0.8360	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0221403	0.0221403	1	1.13	0.3280	Non-Significant Effect
Error	0.1173731	0.0195622	6			
Total	0.1395134	0.0417025	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.42	47.5	0.3400	Equal Variances
Distribution	Shapiro-Wilk Normality	0.955		0.7570	Normal Distribution

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.827	0.923	0.7	1	0.0234	0.126	14.4%	0.0%
41740	4	0.95	0.928	0.972	0.9	1	0.0107	0.0577	6.08%	-8.57%

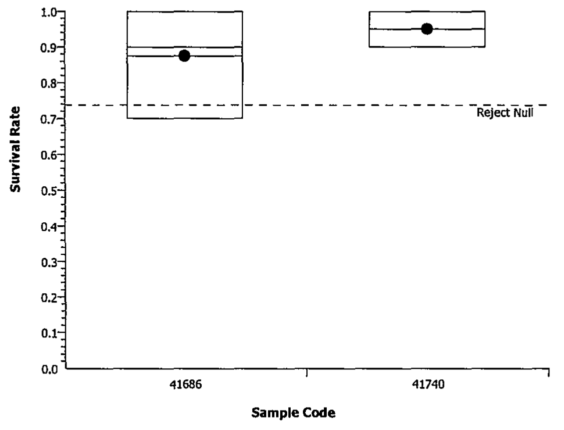
Angular (Corrected) Transformed Summary

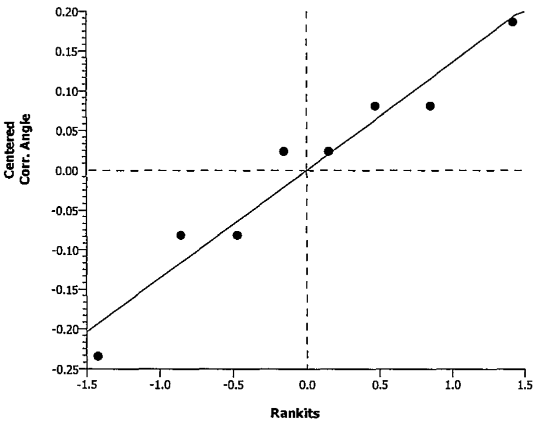
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	1.23	1.16	1.29	0.991	1.41	0.0323	0.174	14.2%	0.0%
41740	4	1.33	1.29	1.37	1.25	1.41	0.0175	0.0941	7.07%	-8.59%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41740	1	1	0.9	0.9

Graphics





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R2-0001777

CETIS Analytical Report

Report Date:	04 Dec-11 09:59 (p 1 of 1)
Link/Link Code:	18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	02-6674-0747	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:58	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					15.1%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41741	-1.52	1.94	0.187	0.9100	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0426072	0.0426072	1	2.31	0.1790	Non-Significant Effect
Error	0.1107333	0.0184555	6			
Total	0.1533404	0.0610627	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.56	47.5	0.2450	Equal Variances
Distribution	Shapiro-Wilk Normality	0.869		0.1460	Normal Distribution

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.827	0.923	0.7	1	0.0234	0.126	14.4%	0.0%
41741	4	0.975	0.956	0.994	0.9	1	0.00928	0.05	5.13%	-11.4%

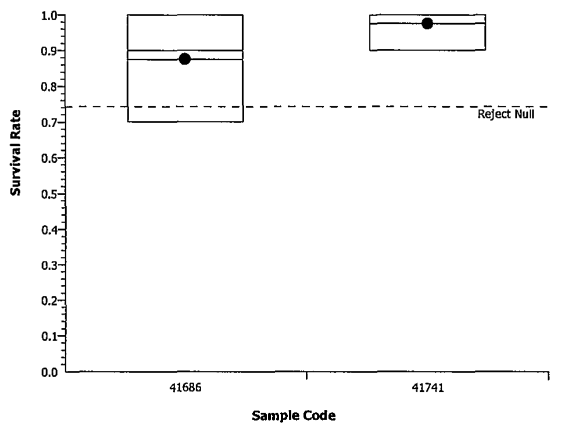
Angular (Corrected) Transformed Summary

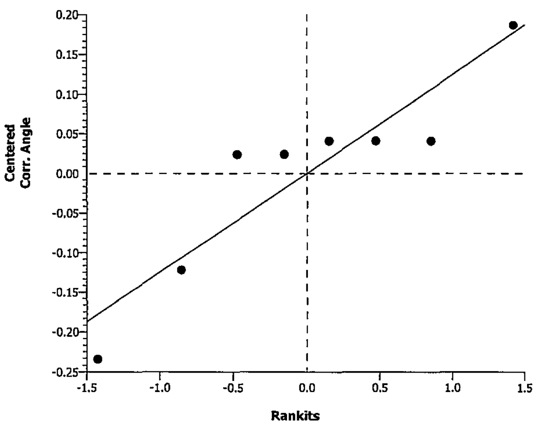
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	1.23	1.16	1.29	0.991	1.41	0.0323	0.174	14.2%	0.0%
41741	4	1.37	1.34	1.4	1.25	1.41	0.0151	0.0815	5.94%	-11.9%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41741	1	1	1	0.9

Graphics





CETIS Analytical Report

Report Date:	04 Dec-11 09:59 (p 1 of 1)
Link/Link Code:	18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	12-6877-0818	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.6.4
Analyzed:	04 Dec-11 9:58	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)		C > T	Not Run					18.7%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41742	-0.612	1.94	0.221	0.7190	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0097275	0.0097275	1	0.375	0.5630	Non-Significant Effect
Error	0.1555992	0.0259332	6			
Total	0.1653267	0.0356607	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	1.4	47.5	0.7880	Equal Variances
Distribution	Shapiro-Wilk Normality	0.926		0.4820	Normal Distribution

Survival Rate Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.875	0.827	0.923	0.7	1	0.0234	0.126	14.4%	0.0%
41742	4	0.925	0.889	0.961	0.8	1	0.0178	0.0957	10.4%	-5.71%

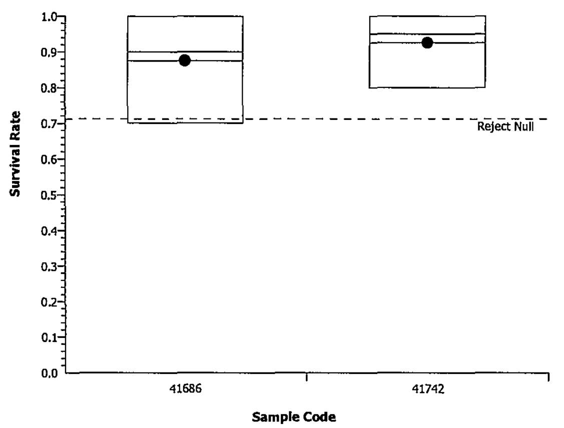
Angular (Corrected) Transformed Summary

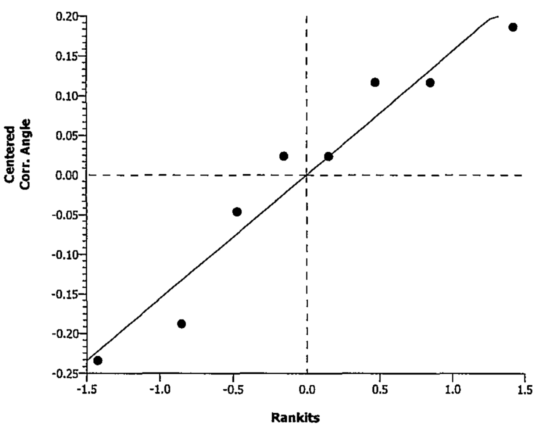
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	1.23	1.16	1.29	0.991	1.41	0.0323	0.174	14.2%	0.0%
41742	4	1.3	1.24	1.35	1.11	1.41	0.0273	0.147	11.3%	-5.69%

Survival Rate Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	1	0.9	0.9	0.7
41742	1	1	0.9	0.8

Graphics





Analyst:________ QA:________ ✓ 12/16/11

R2-0001779

CETIS Analytical Report

Report Date: 21 Dec-11 08:26 (p 1 of 1)
Link/Link Code: 18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test | **Aquatec Biological Sciences, Inc**

Analysis No:	00-3142-0651	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.6.4
Analyzed:	21 Dec-11 8:26	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					36.3%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41687	-0.676	1.94	0.086	0.7380	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0017943	0.0017943	1	0.458	0.5240	Non-Significant Effect
Error	0.0235309	0.0039218	6			
Total	0.0253252	0.0057161	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	60.1	47.5	0.0071	Unequal Variances
Distribution	Shapiro-Wilk Normality	0.925		0.4730	Normal Distribution

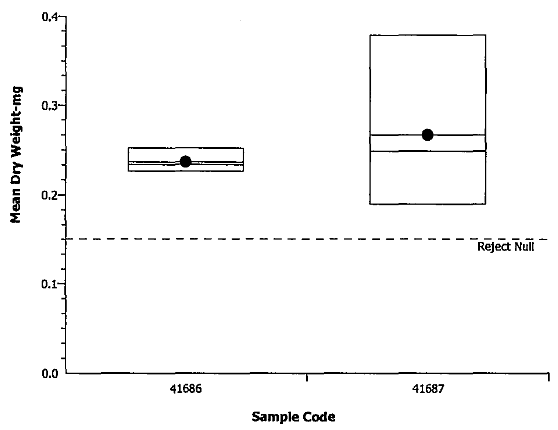
Mean Dry Weight-mg Summary

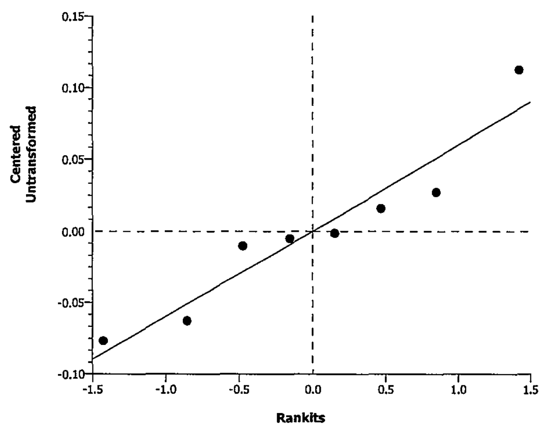
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.237	0.232	0.241	0.227	0.253	0.0021	0.0113	4.79%	0.0%
41687	4	0.267	0.233	0.3	0.19	0.379	0.0163	0.0878	32.9%	-12.7%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.253	0.236	0.232	0.227
41687	0.379	0.294	0.204	0.19

Graphics





CETIS Analytical Report

Report Date:	21 Dec-11 08:27 (p 1 of 1)
Link/Link Code:	18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	02-6844-4071	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.6.4
Analyzed:	21 Dec-11 8:26	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					19.8%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41688	-1.9	1.94	0.047	0.9470	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0042232	0.0042232	1	3.61	0.1060	Non-Significant Effect
Error	0.0070118	0.0011686	6			
Total	0.0112351	0.0053919	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	17.2	47.5	0.0430	Equal Variances
Distribution	Shapiro-Wilk Normality	0.881		0.1940	Normal Distribution

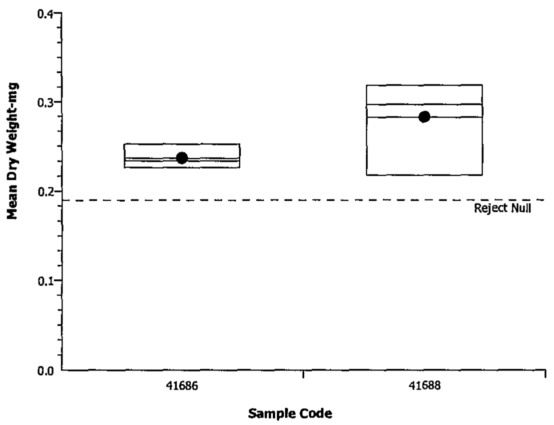
Mean Dry Weight-mg Summary

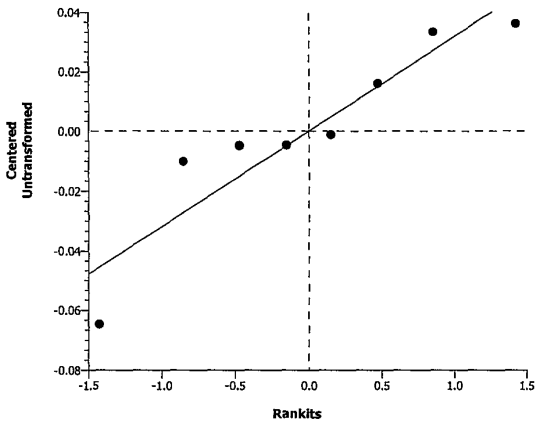
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.237	0.232	0.241	0.227	0.253	0.0021	0.0113	4.79%	0.0%
41688	4	0.283	0.265	0.301	0.218	0.319	0.00873	0.047	16.6%	-19.4%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.253	0.236	0.232	0.227
41688	0.319	0.316	0.278	0.218

Graphics





CETIS Analytical Report

Report Date:	21 Dec-11 08:27 (p 1 of 1)
Link/Link Code:	18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	15-1685-8119	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.6.4
Analyzed:	21 Dec-11 8:26	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					10.3%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41690	-0.261	1.94	0.0243	0.5980	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	2.123E-05	2.123E-05	1	0.068	0.8030	Non-Significant Effect
Error	0.0018740	0.0003123	6			
Total	0.0018952	0.0003336	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	3.87	47.5	0.2960	Equal Variances
Distribution	Shapiro-Wilk Normality	0.918		0.4100	Normal Distribution

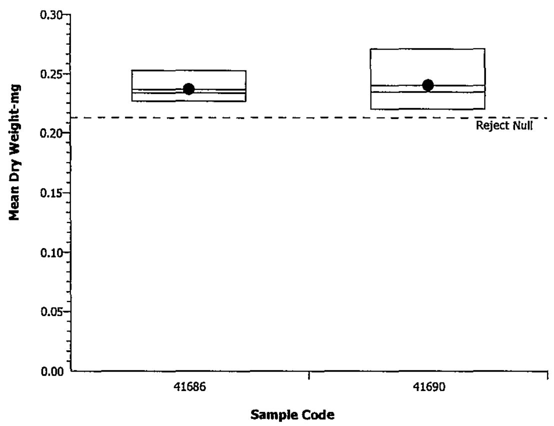
Mean Dry Weight-mg Summary

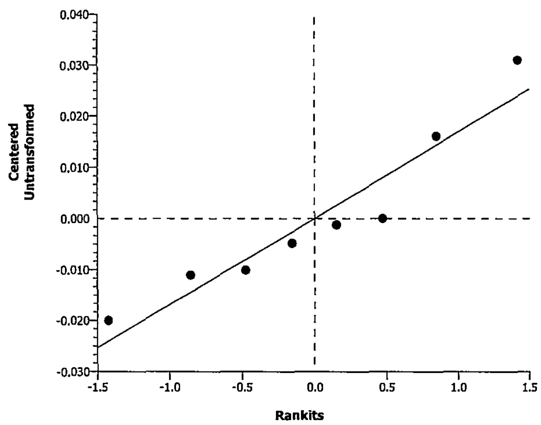
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.237	0.232	0.241	0.227	0.253	0.0021	0.0113	4.79%	0.0%
41690	4	0.24	0.232	0.249	0.22	0.271	0.00414	0.0223	9.28%	-1.38%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.253	0.236	0.232	0.227
41690	0.271	0.24	0.229	0.22

Graphics





Analyst:________ QA: σ 12/21/11

R2-0001782

CETIS Analytical Report

Report Date: 21 Dec-11 08:27 (p 1 of 1)
Link/Link Code: 18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No: 11-4363-0531 **Endpoint:** Mean Dry Weight-mg **CETIS Version:** CETISv1.6.4
Analyzed: 21 Dec-11 8:26 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					17.8%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41739	-0.676	1.94	0.0421	0.7380	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0004291	0.0004291	1	0.457	0.5240	Non-Significant Effect
Error	0.0056324	0.0009387	6			
Total	0.0060614	0.0013678	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	13.6	47.5	0.0594	Equal Variances
Distribution	Shapiro-Wilk Normality	0.928		0.4980	Normal Distribution

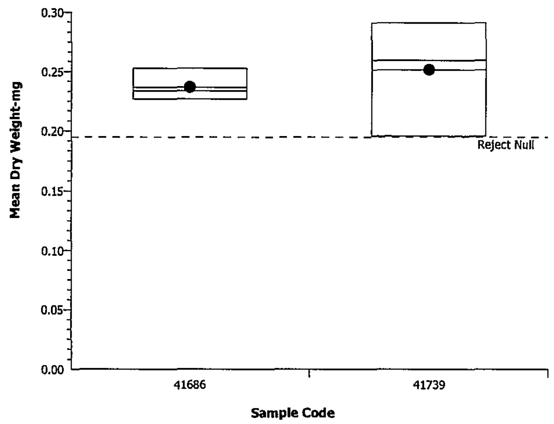
Mean Dry Weight-mg Summary

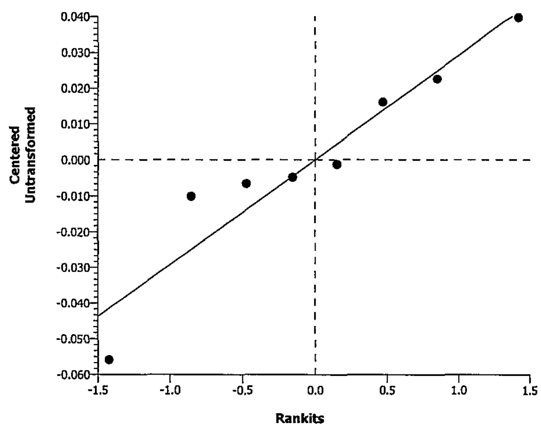
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.237	0.232	0.241	0.227	0.253	0.0021	0.0113	4.79%	0.0%
41739	4	0.251	0.236	0.267	0.196	0.291	0.00777	0.0418	16.6%	-6.19%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.253	0.236	0.232	0.227
41739	0.291	0.274	0.245	0.196

Graphics





R2-0001783

CETIS Analytical Report

Report Date:	21 Dec-11 08:27 (p 1 of 1)
Link/Link Code:	18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	03-7629-6292	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.6.4
Analyzed:	21 Dec-11 8:26	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					11.2%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41740	-5.62	1.94	0.0266	0.9990	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0118775	0.0118775	1	31.6	0.0014	Significant Effect
Error	0.0022548	0.0003758	6			
Total	0.0141323	0.0122533	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	4.85	47.5	0.2270	Equal Variances
Distribution	Shapiro-Wilk Normality	0.899		0.2810	Normal Distribution

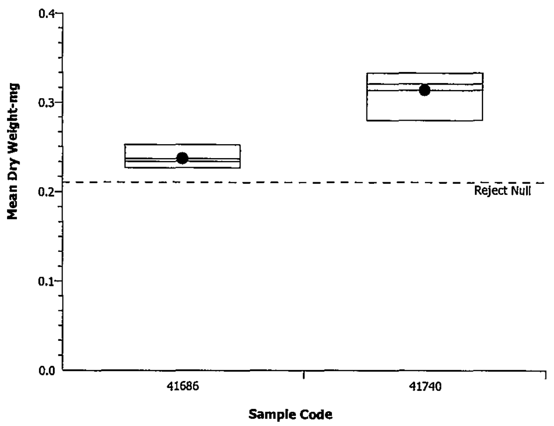
Mean Dry Weight-mg Summary

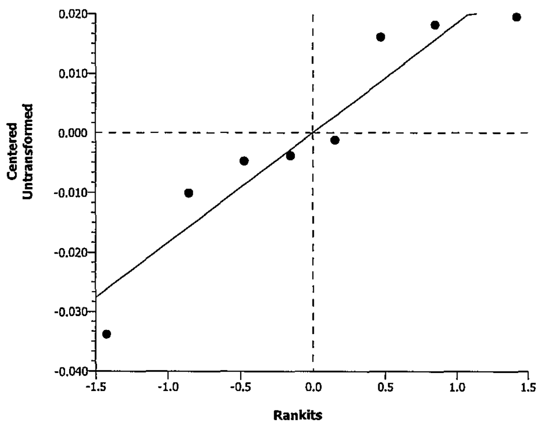
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.237	0.232	0.241	0.227	0.253	0.0021	0.0113	4.79%	0.0%
41740	4	0.314	0.304	0.323	0.28	0.333	0.00464	0.025	7.95%	-32.5%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.253	0.236	0.232	0.227
41740	0.333	0.332	0.31	0.28

Graphics





CETIS Analytical Report

Report Date: 21 Dec-11 08:27 (p 1 of 1)
Link/Link Code: 18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	02-8192-6818	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.6.4
Analyzed:	21 Dec-11 8:26	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					21.4%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41741	-0.478	1.94	0.0507	0.6750	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0003115	0.0003115	1	0.229	0.6490	Non-Significant Effect
Error	0.0081639	0.0013606	6			
Total	0.0084754	0.0016721	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	20.2	47.5	0.0343	Equal Variances
Distribution	Shapiro-Wilk Normality	0.908		0.3400	Normal Distribution

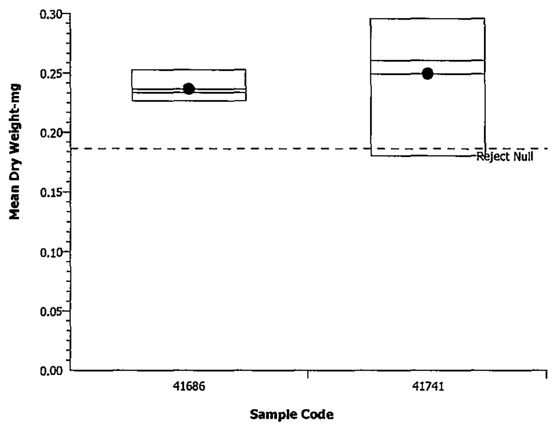
Mean Dry Weight-mg Summary

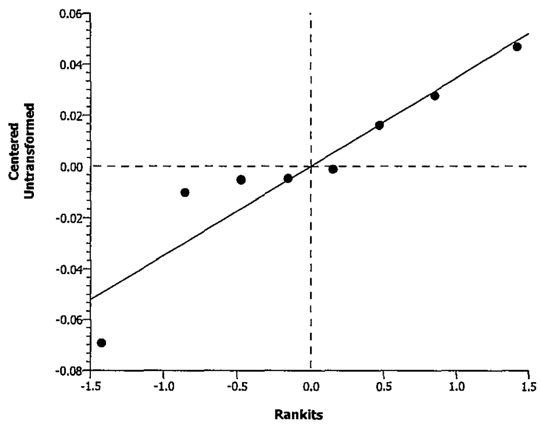
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.237	0.232	0.241	0.227	0.253	0.0021	0.0113	4.79%	0.0%
41741	4	0.249	0.23	0.269	0.18	0.296	0.00946	0.0509	20.4%	-5.27%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.253	0.236	0.232	0.227
41741	0.296	0.277	0.244	0.18

Graphics





CETIS Analytical Report

Report Date: 21 Dec-11 08:27 (p 1 of 1)
Link/Link Code: 18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Analysis No:	18-6629-4679	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.6.4
Analyzed:	21 Dec-11 8:26	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Monte Carlo	NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T	Not Run					20.6%

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	P-Value	Decision(5%)
41686		41742	1.6	1.94	0.0489	0.0805	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(5%)
Between	0.0032299	0.0032299	1	2.55	0.1610	Non-Significant Effect
Error	0.0075865	0.0012644	6			
Total	0.0108164	0.0044943	7			

ANOVA Assumptions

Attribute	Test	Test Stat	Critical	P-Value	Decision(1%)
Variances	Variance Ratio F	18.7	47.5	0.0382	Equal Variances
Distribution	Shapiro-Wilk Normality	0.963		0.8360	Normal Distribution

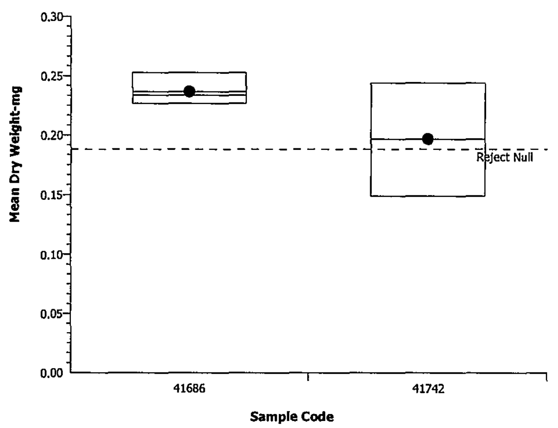
Mean Dry Weight-mg Summary

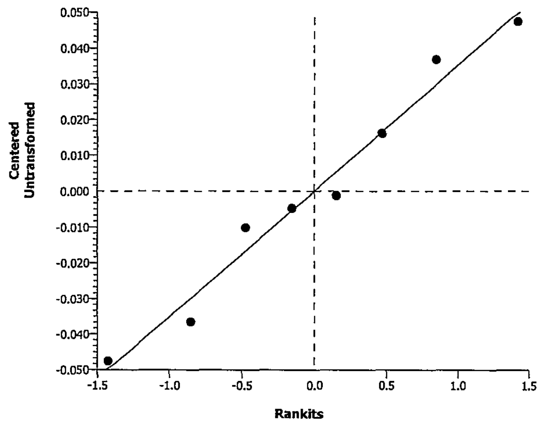
Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
41686	4	0.237	0.232	0.241	0.227	0.253	0.0021	0.0113	4.79%	0.0%
41742	4	0.197	0.178	0.215	0.149	0.244	0.0091	0.049	24.9%	17.0%

Mean Dry Weight-mg Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4
41686	0.253	0.236	0.232	0.227
41742	0.244	0.233	0.16	0.149

Graphics





Analyst:________ QA:________ 12/21/11

R2-0001786

CETIS Test Data Worksheet

Report Date: 21 Dec-11 08:25 (p 1 of 1)
Link/Link Code: 18-4759-1687/12885

Hyalella azteca 28-d Survival and Growth Sediment Test — **Aquatec Biological Sciences, Inc**

Start Date: 04 Nov-11 11:50 **Species:** Hyalella azteca **Sample Code:** 41686
Ending Date: 02 Dec-11 10:45 **Protocol:** EPA/600/R-99/064 (2000) **Sample Source:** CONTROL
Sample Date: 19 Oct-11 **Material:** Control Sediment **Sample Station:** CONTROL

Sample Code	Rep	Pos	# Exposed	# Survived	Total Weight-mg	Tare Weight-mg	Pan Count	Mean Length-mm
41686	1	13	10	10	27.5	25.18	10	
41686	2	1	10	9	27.27	25.15	9	
41686	3	29	10	9	27.3	25.26	9	
41686	4	3	10	7	27.26	25.49	7	
41687	1	11	10	10	27.97	25.03	10	
41687	2	17	10	10	26.49	24.45	10	
41687	3	24	10	9	27.53	26.01	8	
41687	4	30	10	9	29.81	26.4	9	
41688	1	16	10	9	28.28	25.41	9	
41688	2	18	10	10	28.58	25.42	10	
41688	3	8	10	10	27.31	24.53	10	
41688	4	6	10	10	29.11	26.93	10	
41689	1	33	10	0	0	0	0	
41689	2	34	10	0	0	0	0	
41689	3	15	10	0	0	0	0	
41689	4	32	10	0	0	0	0	
41690	1	28	10	9	27.08	24.64	9	
41690	2	21	10	9	27.5	25.52	9	
41690	3	5	10	10	28.63	26.34	10	
41690	4	22	10	10	25.92	23.52	10	
41739	1	27	10	9	27.65	25.03	9	
41739	2	20	10	9	27.19	25.43	9	
41739	3	14	10	10	28.28	25.54	10	
41739	4	9	10	10	27.75	25.3	10	
41740	1	4	10	10	28.21	25.41	10	
41740	2	25	10	9	28.42	25.42	9	
41740	3	36	10	9	27.06	24.27	9	
41740	4	19	10	10	27.46	24.14	10	
41741	1	2	10	9	25.8	24.18	9	
41741	2	31	10	10	27.64	25.2	10	
41741	3	23	10	10	28.62	25.85	10	
41741	4	12	10	10	28.15	25.19	10	
41742	1	10	10	10	27.81	25.37	10	
41742	2	7	10	8	28.15	26.87	8	
41742	3	35	10	9	27.11	25.01	9	
41742	4	26	10	10	27.2	25.71	10	

 Analyst:________ QA:______ 12/21/11

Project: TRC SMC 002 Supplemental

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

SEDIMENT TEST DATA: Test ID: **63016**

Sample Number		Rep.	Surviving Number	Initials	Repick	Initials	Total Surviving	Number weighed	Initial Pan Weight	Final Pan Weight
Control	41686	A	10	J	—	—	10	10	25.18	27.50
		B	9	J	—	—	9	9	25.15	27.27
		C	9	J	—	—	9	9	25.26	27.30
		D	7 (1)	J	0	JG	7	7	25.49	27.26
SD-23	41687	A	10	J	—	—	10	10	25.03	27.97
		B	10	J	—	—	10	10	24.45	26.49
		C	9	J	—	—	9	(2) 8	26.01	27.53
		D	9	J	—	—	9	9	26.40	29.81
SD-04	41688	A	9	JG	—	—	9	9	25.41	28.28
		B	10	JG	—	—	10	10	25.42	28.58
		C	10	JG	—	—	10	10	24.53	27.31
		D	10	JG	—	—	10	10	26.93	29.11
SD-18	41689	A	0	JG	0	J	0	0	25.84	—
		B	0	JG	0	J	0	0	25.42	—
		C	0	JG	0	J	0	0	25.57	—
		D	0	JG	0	J	0	0	25.75	—
SD-15	41690	A	9	J	—	—	9	9	24.64	27.08
		B	9	J	—	—	9	9	25.52	27.50
		C	10	J	—	—	10	10	26.34	28.63
		D	10	J	—	—	10	10	23.52	25.92
SD-31	41739	A	9	JG	—	—	9	9	25.03	27.65
		B	9	JG	—	—	9	9	25.43	27.19
		C	10	JG	—	—	10	10	25.54	28.28
		D	10	JG	—	—	10	10	25.30	27.75
SD-35A	41740	A	10	JG	—	—	10	10	25.41	28.21
		B	9	JG	—	—	9	9	25.42	28.42
		C	9	JG	—	—	9	9	24.27	27.06
		D	10	JG	—	—	10	10	24.14	27.46

NOTES: (1) Mayfly nymph present in this Rep.
(2) only 8 adults found in cup. 12-2-11 JG

Date/Init (Initial Pan Weights):	11-29-11 JG
IN (Date/Time/Temp/Init): JG	12-2-11 1145 82°C
OUT (Date/Time/Temp/Init): JG	12-3-11 1340 80°C

Aquatec Biological Sciences, Inc.
Reviewed by: J Date: 12/16/11

SDG: 12885
Project: 11050

R2-0001788

Project: TRC SMC 002 Supplemental

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

SEDIMENT TEST DATA: Test ID: **63081**

Sample Number		Rep.	Surviving Number	Initials	Repick	Initials	Total Surviving	Number weighed	Initial Pan Weight	Final Pan Weight
SD-13	41741	A	9	J	—	—	9	9	24.18	25.80
		B	10	J	—	—	10	10	25.20	27.64
		C	10	J	—	—	10	10	25.85	28.62
		D	10	J	—	—	10	10	25.19	28.15
SD-10	41742	A	10	JG	—	—	10	10	25.37	27.81
		B	8	JG	0	J	8	8	26.87	28.15
		C	9	JG	—	—	9	9	25.01	27.11
		D	10	JG	—	—	10	10	25.71	27.20

NOTES:

Date/Init (Initial Pan Weights): 11-29-11 JG
IN (Date/Time/Temp/Init): JG 12-2-11 1145 82°C
OUT (Date/Time/Temp/Init): JG 12-3-11 1340 80°C

Aquatec Biological Sciences, Inc.

Reviewed by: J Date: 12/16/11

SDG: 12885
Project: 11050

R2-0001789

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ORGANISM HOLDING AND ACCLIMATION

Species: *Hyalella azteca*
Supplier: ARO
Condition: Normal
Date Received: 11/3/11
Age of Organisms: 6 days
Culture ID: 110311TRC

Acclimation / Holding Procedures: Transfer to holding culture boxes, add laboratory water. Acclimate to water to be used for testing (sediment overlying water formulation). Aerate lightly. Water change at least once (50 %) every two days.

Daily Feeding: 1:1 mix of Selenastrum / YCT, 1-3 mL (Maintain hint of green algal coloration on culture box bottom). Also add a pinch of ground Tetrafin. Do not allow excess food to accumulate.

Date	Fed	Temp.	pH	D.O.	Cond.	Condition	Water Change	Initials
11/3/11	YC	15.7°C	7.1	19.3	897	Normal	50% w/ Sed Recon.	JG
11/4/11	YC	21.8	7.6	8.2	519	Normal	50% w/ Sed Recon.	JG
__/__/__								
__/__/__								
__/__/__								

N = Normal, appear healthy. Record # dead if any observed.

Hyalella azteca Initial Dry Weight

Replicate	No. of Org. weighed	Initial Pan weight (mg)	Final Pan weight (mg)	Initial Average wt. (mg)
1	10	24.31	24.43	0.012
2	10	25.17	25.27	0.01
3	10	23.78	23.89	0.011
4	10	23.81	23.95	0.014
5	10	23.33	23.46	~~0.007~~ 0.013
6	10	24.10	24.24	0.014
7	10	22.78	22.91	0.013
8	10	22.56	22.71	0.015
	Initials	JG	JG	
	Date	11-3-11	11-5-11	

IN/OUT of Oven:

IN: Date/Time/Initials/Temp.
11-4-11 1420 JG 79°C
OUT: Date/Time/Initials/Temp.
11-5-11 1240 JG 80°C

Aquatec Biological Sciences, Inc.
Reviewed by: ____ Date: 12/16/11

122

SDG: 12885
Project: 11050

R2-0001790

Aquatic Research Organisms

DATA SHEET

I. Organism History

Species Hyalella azteca

Source: Lab reared ✓ Hatchery reared ____ Field collected ____

Hatch date 10/25/11 Receipt date ____

Lot number 10 28 11 HA Strain ARO

Brood origination OS Cuts ARO

II. Water Quality

Temperature ~21 °C Salinity — ppt D.O. >7.7 ppm

pH ~7.4 su Hardness ~120 ppm Alkalinity ~140 ppm

Received:
11-3-11
Temp.=15.7°C
pH=7.1
D.O.=19.3
Cond.=897

III. Culture Conditions

Freshwater ✓ Saltwater ____ Other ____

Recirculating ____ Flow through ____ Static renewal X

DIET: Flake food ✓ Phytoplankton ____ Trout chow x

Artemia ____ Rotifers ____ YCT ____ Other ____

Added Sed Recon.

Prophylactic treatments: ____

Comments: ____

For TRC

IV. Shipping Information

Client: [illegible] VT # of Organisms 400+

Carrier: FedEx Date shipped 11/2/11

Biologist: [illegible]

PO BOX 1271 HAMPTON NH 03843-1271 (603) 926-1650 AROFISH@AOL.COM

R2-0001791

Project: TRC SMC 002 Supplemental

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

CHEMISTRY DATA: Chemical analysis Date/Initials are noted on last page of Days 0 - 15 chemistry data sheets

Sample	Analysis	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
41686	pH	6.9			6.9		7.3		7.2			7.1		7.0		7.2	
Control	DO	7.4			7.6		7.5		7.6			7.0		7.5		7.3	
	Cond.	320			—		344		—			—		310		—	
41687	pH	7.1			7.0		7.2		7.2			7.1		7.0		7.2	
SD-23	DO	7.4			7.6		7.3		7.6			7.5		7.4		7.6	
	Cond.	365			—		355		—			—		316		—	
41688	pH	7.2			7.0		7.2		7.2			7.0		7.1		7.3	
SD-04	DO	7.0			7.4		7.2		7.5			7.3		6.8		7.4	
	Cond.	375			—		354		—			—		324		—	
41689	pH	7.0			7.0		7.1		7.1			7.0		7.1		7.2	
SD-18	DO	6.9			7.5		7.2		7.4			7.4		7.2		7.6	
	Cond.	356			—		352		—			—		310		—	
41690	pH	7.3			7.1		7.2		7.2			7.1		7.1		7.2	
SD-15	DO	7.0			7.4		7.3		7.5			7.4		7.2		7.5	
	Cond.	470			—		384		—			—		327		—	
41739	pH	7.0			7.0		7.0		7.0			6.9		7.0		7.1	
SD-31	DO	7.4			7.7		7.4		7.7			7.6		7.3		7.6	
	Cond.	295			—		325		—			—		298		—	
41740	pH	6.9			6.9		6.9		6.9			6.9		6.8		7.0	
SD-35A	DO	7.3			7.5		7.2		7.6			7.5		7.2		7.5	
	Cond.	302			—		328		—			—		296		—	
41741	pH	7.0			7.0		6.9		7.0			7.0		6.9		7.0	
SD-13	DO	7.4			7.6		7.3		7.6			7.6		7.4		7.5	
	Cond.	353			—		321		—			—		314		—	
41742	pH	6.9			6.9		6.8		6.9			6.9		6.9		7.0	
SD-10	DO	7.1			7.7		7.1		7.2			7.2		7.0		7.4	
	Cond.	330			—		345		—			—		305		—	
	Date	11/4			11/7		11/9		11/11			11/14		11/16		11/18	
	Initials	KK			KK		JG		JG			KK		KK		JG	

Project: TRC SMC 002 Supplemental

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

CHEMISTRY DATA: Chemical analysis Date/Initials are noted on last page of Days 16 - 31 chemistry data sheets

Sample	Analysis	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
41686	pH		7.2		7.2		7.2			7.1		7.0	6.9				
Control	DO		7.6		7.1		7.4			7.4		7.1	7.3				
	Cond.		—		337		—			—		326	324				
41687	pH		7.3		7.1		7.2			7.2		7.1	7.0				
SD-23	DO		7.4		6.9		7.3			7.3		7.2	7.1				
	Cond.		—		346		—			—		336	335				
41688	pH		7.7		7.2		7.3			7.2		7.0	7.0				
SD-04	DO		6.8		6.4		7.0			7.2		6.9	6.9				
	Cond.		—		358		—			—		322	325				
41689	pH		7.2		6.8		7.0			7.1		7.0	6.9				
SD-18	DO		7.3		6.8		7.2			7.1		7.2	6.9				
	Cond.		—		330		—			—		319	316				
41690	pH		7.2		6.8		7.1			7.2		7.0	7.0				
SD-15	DO		7.4		6.9		7.3			7.1		7.0	7.1				
	Cond.		—		341		—			—		330	331				
41739	pH		7.1		6.7		7.0			7.1		7.0	7.0				
SD-31	DO		7.5		6.9		7.4			7.4		7.1	7.2				
	Cond.		—		322		—			—		315	315				
41740	pH		7.0		6.7		7.0			7.2		7.0	6.9				
SD-35A	DO		7.3		6.6		7.1			7.0		6.8	6.9				
	Cond.		—		323		—			—		324	322				
41741	pH		7.1		6.7		7.0			7.1		7.0	6.9				
SD-13	DO		7.5		6.9		7.4			7.2		7.1	7.0				
	Cond.		—		337		—			—		321	322				
41742	pH		7.1		6.7		7.0			7.2		7.1	6.9				
SD-10	DO		7.5		6.9		7.2			7.5		7.0	7.1				
	Cond.		—		329		—			—		317	322				
	Date		11/21		11/23		11/25			11/28		11/30	12/1				
	Initials		KK		[illegible]		JG			RL		JG	JG				

Aquatec Biological Sciences, Inc.
125
Reviewed by: [illegible] Date: 12/16/11

SDG: 12885
Project: 11050

R2-0001793

Aquatec Biological Sciences

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E-Mail: sheim@trcsolutions.

ALKALINITY AND HARDNESS

Sample ID:			Sample Date:	Alkalinity: (mg/L)	Hardness: (mg/L)
41686	Control	Ha 28 Day 0	11/4/2011	52.0	80.0
41687	SD-23	Ha 28 Day 0	11/4/2011	60.0	80.0
41688	SD-04	Ha 28 Day 0	11/4/2011	68.0	82.0
41689	SD-18	Ha 28 Day 0	11/4/2011	52.0	78.0
41690	SD-15	Ha 28 Day 0	11/4/2011	96.0	76.0
41739	SD-31	Ha 28 Day 0	11/4/2011	36.0	64.0
41740	SD-35A	Ha 28 Day 0	11/4/2011	44.0	68.0
41741	SD-13	Ha 28 Day 0	11/4/2011	60.0	56.0
41742	SD-10	Ha 28 Day 0	11/4/2011	44.0	70.0
41686	Control	Ha 28 Day 27	12/1/2011	60.0	86.0
41687	SD-23	Ha 28 Day 27	12/1/2011	68.0	92.0
41688	SD-04	Ha 28 Day 27	12/1/2011	64.0	88.0
41689	SD-18	Ha 28 Day 27	12/1/2011	56.0	84.0
41690	SD-15	Ha 28 Day 27	12/1/2011	68.0	86.0
41739	SD-31	Ha 28 Day 27	12/1/2011	56.0	80.0
41740	SD-35A	Ha 28 Day 27	12/1/2011	60.0	86.0
41741	SD-13	Ha 28 Day 27	12/1/2011	64.0	84.0
41742	SD-10	Ha 28 Day 27	12/1/2011	60.0	84.0

Reviewed by: SJ Date: 12/16/11

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SDG: 12885
Project: 11050

AMMONIA ANALYSIS REPORT

Project: TRC SMC 002 Supplemental

100.4-28Ha **Amphipod, H. azteca, 28-D Survival and Growth Test**

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

Sample	Pore Water (mg/L) 11/3/2011	Overlying Water (mg/L) 11/4/2011	12/1/2011
41686 - **Control**	1.0	0.4	0.2
41687 - **SD-23**	3.9	0.8	0.2
41688 - **SD-04**	6.1	1.2	0.1
41689 - **SD-18**	1.1	0.4	0.2
41690 - **SD-15**	1.2	0.4	0.2
41739 - **SD-31**	1.9	0.9	0.3
41740 - **SD-35A**	2.5	1.0	0.3
41741 - **SD-13**	1.4	0.5	0.2
41742 - **SD-10**	13.2	2.1	0.2

BD- Indicates a concentration value below the reporting limit (<0.1).

Reviewed by: J Date: 12/16/11

Sunday, December 04, 2011

Amphipod, H. azteca, 28-D Survival and Growth Test

Aquatec Biological Sciences

Channel #: 7

TEMPERATURE LOG (^{o}C)

Client: TRC
Project: TRC SMC 002 Supplemental
Project #: 11050
SDG: 12885
Species: *Hyalella azteca*

	Hour of the Day																								Daily		
DAY	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	AVE	MIN	MAX
11/04/2011													22.6	22.8	22.9	23.3	23.2	23.1	23.0	23.2	23.1	23.5	23.5	23.3	23.1	22.6	23.5
11/05/2011	23.3	23.1	22.9	23.7	23.3	23.2	23.1	23.0	23.6	23.5	23.4	22.9	22.7	23.3	23.3	23.2	22.8	23.0	23.5	22.8	23.0	23.3	23.3	22.9	23.2	22.7	23.7
11/06/2011	23.0	22.8	22.8	22.8	23.0	23.4	23.2	23.1	22.8	22.9	23.1	23.1	22.8	23.2	23.2	23.4	23.0	23.0	23.0	23.3	23.3	22.8	23.0	23.3	23.1	22.8	23.4
11/07/2011	23.3	23.5	23.1	23.2	23.1	22.8	22.9	23.1	23.3	23.1	23.0	22.9	22.9	22.9	23.2	23.2	23.1	23.1	22.9	22.9	23.3	23.3	22.7	22.9	23.1	22.7	23.5
11/08/2011	23.1	23.1	23.0	23.2	23.1	22.8	22.8	23.0	23.2	23.2	23.2	22.8	23.0	23.1	23.5	22.7	22.8	22.9	23.3	23.3	23.0	23.3	23.0	23.0	23.1	22.7	23.5
11/09/2011	23.2	22.9	23.3	23.2	22.9	22.9	23.2	23.3	22.8	22.9	23.2	23.3	22.7	23.0	23.5	22.7	22.9	23.3	22.7	23.3	23.0	22.8	23.5	22.8	23.1	22.7	23.5
11/10/2011	23.1	22.9	22.8	22.9	23.3	22.7	23.0	23.5	22.8	23.0	23.3	22.7	22.8	23.2	23.3	22.8	23.1	23.3	23.0	22.9	23.3	22.8	23.0	23.3	23.0	22.7	23.5
11/11/2011	22.8	22.6	22.9	23.0	23.4	23.1	22.9	23.2	23.0	23.1	23.4	23.0	23.0	22.4	23.1	23.3	23.0	23.3	23.3	22.8	23.3	23.2	22.9	23.5	23.1	22.4	23.5
11/12/2011	22.8	22.9	23.2	23.2	23.3	22.8	22.9	23.1	23.3	23.0	23.0	23.3	23.2	23.0	23.3	22.9	23.0	23.0	23.1	23.5	22.8	22.8	23.1	23.2	23.1	22.8	23.5
11/13/2011	23.1	22.8	23.3	23.2	23.0	22.8	22.8	23.2	23.2	23.3	22.8	22.8	22.8	22.8	23.3	22.8	22.8	23.2	23.0	23.1	23.3	22.8	23.2	23.1	23.0	22.8	23.3
11/14/2011	22.9	23.2	23.4	22.8	23.1	23.3	22.9	23.2	23.3	23.0	23.0	23.0	23.2	23.1	23.4	22.8	23.3	23.2	22.8	23.0	23.5	22.8	23.1	23.3	23.1	22.8	23.5
11/15/2011	22.8	22.9	23.2	23.3	22.8	22.9	23.3	23.1	23.1	23.5	22.8	23.1	23.3	22.9	23.3	22.8	23.2	22.8	23.1	23.4	23.0	23.0	23.1	22.8	23.1	22.8	23.5
11/16/2011	22.8	23.1	23.2	23.4	22.8	23.0	23.0	23.3	23.1	22.7	23.0	23.2	23.1	23.0	23.3	22.9	23.0	23.3	23.3	22.8	23.1	23.3	22.9	23.0	23.1	22.7	23.4
11/17/2011	23.2	22.7	23.2	23.2	23.1	23.2	23.2	22.9	22.8	22.7	23.0	22.8	22.8	22.7	23.2	23.2	23.0	22.7	22.8	23.0	22.6	23.1	23.3	23.1	23.0	22.6	23.3
11/18/2011	22.8	22.9	23.1	23.2	23.2	23.3	22.8	23.1	22.6	23.0	23.1	23.1	22.7	22.8	22.8	22.8	23.1	23.2	23.2	22.8	23.0	23.0	22.9	23.1	23.0	22.6	23.3
11/19/2011	23.2	23.1	23.0	23.0	22.6	22.7	22.7	22.7	22.9	23.0	23.3	23.1	23.1	23.2	22.8	23.1	23.0	23.0	22.8	22.7	22.8	23.2	23.1	23.2	23.0	22.6	23.3
11/20/2011	23.1	23.0	23.1	23.2	23.2	22.7	22.9	23.2	23.2	23.0	22.8	22.7	23.0	23.0	23.0	22.8	22.8	23.2	22.7	23.1	23.3	22.8	23.0	23.3	23.0	22.7	23.3
11/21/2011	23.0	23.0	23.3	22.7	23.0	22.7	22.8	22.8	22.7	23.0	23.3	23.2	23.1	22.8	22.9	22.7	23.0	22.7	22.8	22.8	23.0	23.1	23.0	23.1	22.9	22.7	23.3
11/22/2011	23.0	23.0	23.1	22.8	23.1	23.3	22.9	23.0	23.0	22.9	23.0	22.7	22.8	22.4	22.9	23.0	22.9	22.9	22.8	23.0	22.8	22.9	23.0	23.1	22.9	22.4	23.3
11/23/2011	22.8	23.0	23.1	23.1	23.1	23.1	23.2	23.1	22.8	23.0	22.6	22.7	22.8	22.7	23.0	22.6	22.6	22.8	23.0	23.0	23.1	23.0	22.9	23.0	22.9	22.6	23.2
11/24/2011	23.0	22.7	23.1	23.0	23.1	23.0	23.2	23.2	23.0	23.0	23.0	22.6	22.7	22.8	23.0	23.0	23.0	22.9	23.0	23.1	23.1	23.0	23.1	23.0	23.0	22.6	23.2
11/25/2011	23.1	23.2	22.9	22.9	22.8	23.0	23.0	22.8	22.8	22.7	22.8	23.3	23.2	22.6	23.0	22.7	23.1	23.1	23.1	23.1	22.8	22.7	23.0	23.1	23.0	22.6	23.3
11/26/2011	23.2	22.8	23.1	23.1	22.8	22.7	22.7	22.9	23.0	22.8	22.8	22.8	22.8	23.0	22.7	22.9	23.2	23.1	22.8	23.0	23.3	23.0	22.8	22.9	22.9	22.7	23.3
11/27/2011	23.1	23.2	23.1	23.1	23.0	23.0	23.1	23.0	22.9	23.1	22.7	22.7	22.8	23.2	23.1	23.1	23.0	22.8	22.8	23.1	23.1	23.0	22.7	22.8	23.0	22.7	23.2
11/28/2011	23.1	23.2	23.0	23.3	22.6	22.8	22.9	23.0	23.1	23.2	22.8	22.7	23.0	23.1	23.2	23.0	22.9	23.2	22.7	23.0	23.1	22.8	23.0	23.2	23.0	22.6	23.3
11/29/2011	23.0	23.1	23.1	23.1	23.0	23.0	23.1	22.8	22.8	22.8	23.1	23.2	23.1	22.9	23.1	22.8	23.0	22.8	23.0	23.1	22.7	23.0	22.8	23.1	23.0	22.7	23.2
11/30/2011	22.7	23.1	23.0	22.8	23.0	23.1	22.7	23.1	23.0	22.9	23.0	22.9	22.7	22.6	22.7	22.9	23.2	22.8	22.9	23.2	23.2	22.7	22.9	23.0	22.9	22.6	23.2
12/01/2011	23.0	23.1	23.1	23.1	22.8	23.0	22.9	23.1	23.2	23.1	22.7	22.7	22.6	22.8	22.7	22.8	22.8	23.0	22.8	22.8	22.9	22.7	22.8	22.8	22.9	22.6	23.2
12/02/2011	22.8	22.6	22.8	22.7	22.8	22.6	22.6	22.6	22.5	22.5	22.6														22.6	22.5	22.8
Overall Test Temperature:																									**23.0**	**22.4**	**23.7**

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Reviewed by: J Date: 12/16/11

R2-0001796

Aquatec Biological Sciences, Inc.

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SEDIMENT CHARACTERIZATION:

Sample Number	Client Sample ID	Sediment Characteristics	Pore Water pH	Organisms Present	Initial /Date	PW pH
41686 Sieved: Y / N 0.5 Mesh size	Control	Fine & medium sand sieved in field	6.1	None seen	10/19/11	6.0
41687 Sieved: Y / N 1.0 Mesh size	SD-23	Medium sand with lots of detritus of fibrous material.	7.1	None seen	10/19/11	6.7
41688 Sieved: Y / N 1.0 Mesh size	SD-04	fine to medium sand with vegetative detritus and small stones.	6.8	None seen		6.6
41689 Sieved: Y / N 1.0 Mesh size	SD-18	DARK Soft fine mud mixed in with a very high volume of vegetative material. very fluid	6.2	None seen		6.1
41690 Sieved: Y / N 1.0 Mesh size	SD-15	DARK Soft fine fluid mud in with vegetative material, sticks	7.3	None seen		7.1
41739 Sieved: Y / N 1.0 Mesh size	SD-31	DARK Cohesive sediment rich in organics, some clay-like material. Soft fibers	5.2	None seen		5.1
41740 Sieved: Y / N 1.0 Mesh size	SD-35A	DARK Soft fluid sediment with high proportion of vegetative material, sticks.	5.0	None seen		5.0
41741 Sieved: Y / N 1.0 Mesh size	SD-13	Brown fine soft sediment / fluid with vegetative material & sticks	6.3	None seen		6.2
41742 Sieved: Y / N 1.0 Mesh size	SD-10	Brown medium sand w/ vegetative material, sticks	6.0	None seen		5.9

Sediments loaded into test replicate beakers 10/19/11

Overlying water added 10/19/11

Samples re-sieved and loaded for Day 28 test. 11-3-11 JG

Aquatec Biological Sciences, Inc.
Reviewed by: ______ Date: 12/16/11.

SDG: 12885
Project: 11050

R2-0001797

Project: TRC SMC 002 Supplemental **WEEK OF:** 10/30/ 11

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

DAILY SEDIMENT MONITORING - CHECKLIST

ACTIVITY / DAY

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s):						22.9	23.2
Fill Reservoirs						✓	✓
Delivery tubes in place						✓	✓
Check water Supply						✓	✓
Empty Waste Buckets						✓	✓
Floater/~~Aeration~~* Check						N/A	✓
Chems Collected / ok?						✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?						✓	✓
Syringes filing?						✓	✓
Needles flowing?						✓	✓
Drainage to Waste - ok?						✓	✓
Feeding (Time/Init.)						1125 KK	1205 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): See Above						23.0	22.9
Fill Reservoirs					✓	✓	✓
Delivery tubes in place					✓	✓	✓
Check water Supply					✓	✓	✓
Empty Waste Buckets					✓	✓	✓
Floater/~~Aeration~~* Check					N/A	✓	✓
Date:					11/3/11	11-4-11	11-5-11
Initials:					KK	KK JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)					SEDIMENTS LOADED	TEST START: 1150 JG ~~/J~~ QC counts: JG /J	

SDG: 12885
Project: 11050

R2-0001798

Project: TRC SMC 002 Supplemental **WEEK OF:** 11 / 6 / 11

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

DAILY SEDIMENT MONITORING - CHECKLIST

ACTIVITY / DAY

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s):	23.2	23.2	23.0	22.9	23.0	23.1	22.9
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	✓	✓
Chems Collected / ok?	—	✓	—	✓	—	✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	✓	✓	✓
Syringes filing?	✓	✓	✓	✓	✓	✓	✓
Needles flowing?	✓	✓	✓	✓	✓	✓	✓
Drainage to Waste - ok?	✓	✓	✓	✓	✓	✓	✓
Feeding (Time/Init.)	1210 KK	1240 KK	1615 JG	1320 JG	1310 JG	1410 JG	1500 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): See Above	23.1	23.5	23.0	23.0	23.2	23.0	22.9
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	✓	✓
Date:	11/6/11	11/7/11	11-8-11	11-9-11	11-10-11	11-11-11	11-12-11
Initials:	KK	KK	JG	JG	JG	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)							

Aquatec Biological Sciences, Inc.

Reviewed by: JT Date: 12/16/11

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SDG: 12885

Project: 11050

R2-0001799

Project: TRC SMC 002 Supplemental **WEEK OF:** 11/13/11

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

DAILY SEDIMENT MONITORING - CHECKLIST

ACTIVITY / DAY — AM	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s):	23.4	23.2	23.6	23.1	23.2	23.1	22.9
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration*~~ Check	✓	✓	✓	✓	✓	✓	✓
Chems Collected / ok?	—	✓	—	✓	—	✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	✓	✓	✓
Syringes filing?	✓	✓	✓	✓	✓	✓	✓
Needles flowing?	✓	✓	✓	✓	✓	✓	✓
Drainage to Waste - ok?	✓	✓	✓	✓	✓	✓	✓
Feeding (Time/Init.)	1320 KK	15:30 JT	1540 KK	1400 JG	1530 JG	1305 JG	1255 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): See Above	23.2	23.0	23.7	23.2	22.9	23.1	23.3
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration*~~ Check	✓	✓	✓	✓	✓	✓	✓
Date:	11/13/11	11/14/11	11/15/11	11/16/11	11/17/11	11-18-11	11-19-11
Initials:	KK	KK/JT	KK	KK	KK	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)							

Aquatec Biological Sciences, Inc.
Reviewed by: JT Date: 12/16/11

SDG: 12885
Project: 11050

Project: TRC SMC 002 Supplemental **WEEK OF:** 11 / 20 / 11

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

DAILY SEDIMENT MONITORING - CHECKLIST

ACTIVITY / DAY

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): **Probe #(s):**	23.0	23.5	23.2	23.5	23.0	23.1	23.0
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration*~~ Check	✓	✓	✓	✓	✓	✓	✓
Chems Collected / ok?	—	✓	—	✓	—	✓	—

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	✓	✓	✓
Syringes filing?	✓	✓	✓	✓	✓	✓	✓
Needles flowing?	✓	✓	✓	✓	✓	✓	✓
Drainage to Waste - ok?	✓	✓	✓	✓	✓	✓	✓
Feeding (Time/Init.)	1215 KK	1405 KK	1445 JG	13:10 J	1150 JG	1145 JG	1200 JG

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): **Probe #(s): See Above**	23.0	23.1	22.9	23.8	22.2	22.9	23.0
Fill Reservoirs	✓	✓	✓	✓	✓	✓	✓
Delivery tubes in place	✓	✓	✓	✓	✓	✓	✓
Check water Supply	✓	✓	✓	✓	✓	✓	✓
Empty Waste Buckets	✓	✓	✓	✓	✓	✓	✓
Floater/~~Aeration*~~ Check	✓	✓	✓	✓	✓	✓	✓
Date:	11/20/11	11/21/11	11-22-11	11/23/11	11-24-11	11-25-11	11-26-11
Initials:	KK	KK	JG	J	JG	JG	JG

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)							

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Reviewed by: J Date: 12/16/11

SDG: 12885
Project: 11050

R2-0001801

Project: TRC SMC 002 Supplemental **WEEK OF:** 11/27/11

100.4-28Ha Amphipod, H. azteca, 28-D Survival and Growth Test

Species: *Hyalella azteca* Reference: EPA/600/R-99/064 SOP: TOX3-016

DAILY SEDIMENT MONITORING - CHECKLIST

ACTIVITY / DAY

AM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s):	23.0	23.5	23.2	23.2	23.3	23.1	
Fill Reservoirs	✓	✓	✓	✓	✓	/	
Delivery tubes in place	✓	✓	✓	✓	✓	/	
Check water Supply	✓	✓	✓	✓	✓	/	
Empty Waste Buckets	✓	✓	✓	✓	✓	/	
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	/	
Chems Collected / ok?	—	✓	—	✓	✓	/	

NOON

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Splitter box(s) filling?	✓	✓	✓	✓	✓	/	
Syringes filing?	✓	✓	✓	✓	✓	/	
Needles flowing?	✓	✓	✓	✓	✓	/	
Drainage to Waste - ok?	✓	✓	✓	✓	✓	/	
Feeding (Time/Init.)	1335 RK	1250 RK	1250 JG	1645 JG	1335 JG	/	

PM

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Temperature(s): Probe #(s): See Above	23.3	23.5	22.9	23.5	22.8	/	
Fill Reservoirs	✓	✓	✓	✓	✓	/	
Delivery tubes in place	✓	✓	✓	✓	✓	/	
Check water Supply	✓	✓	✓	✓	✓	/	
Empty Waste Buckets	✓	✓	✓	✓	✓	/	
Floater/~~Aeration~~* Check	✓	✓	✓	✓	✓	/	
Date:	11/27/11	11/28/11	11-29-11	11-30-11	12-1-11	12-2-11	
Initials:	RK	RK	JG	JG	JG	JG	

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Corrective Actions / Comments (Initial/Time) * Aeration required if DO is below/reaching minimum DO reqirements (Note when initiated)						Test ended: 12-2-11 1045	

Aquatec Biological Sciences, Inc.

Reviewed by: [signature] Date: 12/16/11

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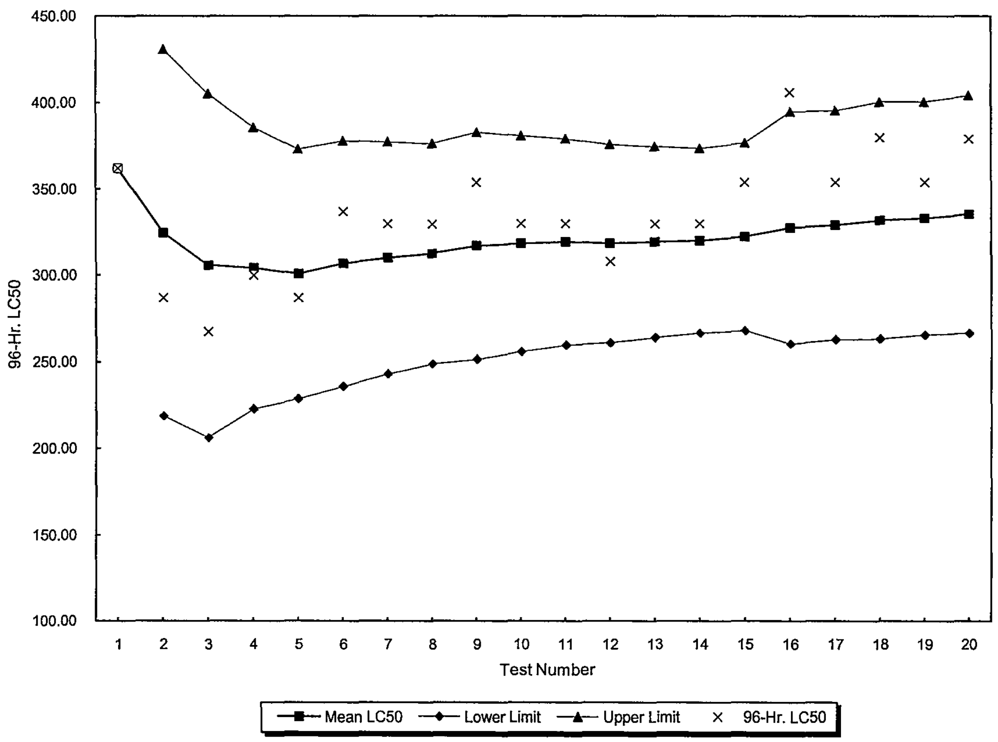
SDG: 12885
Project: 11050

R2-0001802

Standard Reference Toxicant Control Charts

Reference Toxicant Control Chart
Hyalella azteca
in Potassium chloride (mg/L)

Test Number	Test Date	Organism Age (Days)	96-Hr. LC50	Mean LC50	Lower Limit	Upper Limit	Organism Source
1	11/05/08	12	362.106	362.11			Aquatic Research Organisms
2	11/26/08	8	287.175	324.64	218.67	430.61	Aquatic Research Organisms
3	03/25/09	8	267.836	305.71	206.12	405.29	Aquatic Research Organisms
4	04/02/09	9	300.053	304.29	222.79	385.80	Aquatic Research Organisms
5	08/31/09	9	287.175	300.87	228.64	373.10	Aquatic Research Organisms
6	09/25/09	8	337.050	306.90	235.86	377.94	Aquatic Research Organisms
7	10/30/09	12	329.880	310.18	243.05	377.32	Aquatic Research Organisms
8	02/25/10	8	329.877	312.64	248.95	376.34	Aquatic Research Organisms
9	05/06/10	8	354.000	317.24	251.59	382.89	Aquatic Research Organisms
10	05/18/10	12	330.000	318.52	256.09	380.94	Aquatic Research Organisms
11	06/08/10	7	330.000	319.56	259.94	379.18	Aquatic Research Organisms
12	11/09/10	7	308.000	318.60	261.36	375.83	Aquatic Research Organisms
13	11/19/10	12	330.000	319.47	264.31	374.64	Aquatic Research Organisms
14	04/29/11	12	330.000	320.23	266.93	373.52	Aquatic Research Organisms
15	06/09/11	8	354.000	322.48	268.24	376.72	Aquatic Research Organisms
16	06/22/11	8	406.000	327.70	260.69	394.70	Aquatic Research Organisms
17	07/22/11	8	354.000	329.24	263.12	395.37	Aquatic Research Organisms
18	07/27/11	8	380.000	332.06	263.60	400.53	Aquatic Research Organisms
19	10/20/11	8	354.000	333.22	265.93	400.51	Aquatic Research Organisms
20	11/04/11	12	379.000	335.51	266.89	404.13	Aquatic Research Organisms



\SRTS\Ha acute KCL

APPENDIX E
CORRELATION GRAPHS FOR TISSUE CONCENTRATIONS AND ENVIRONMENTAL MEDIA

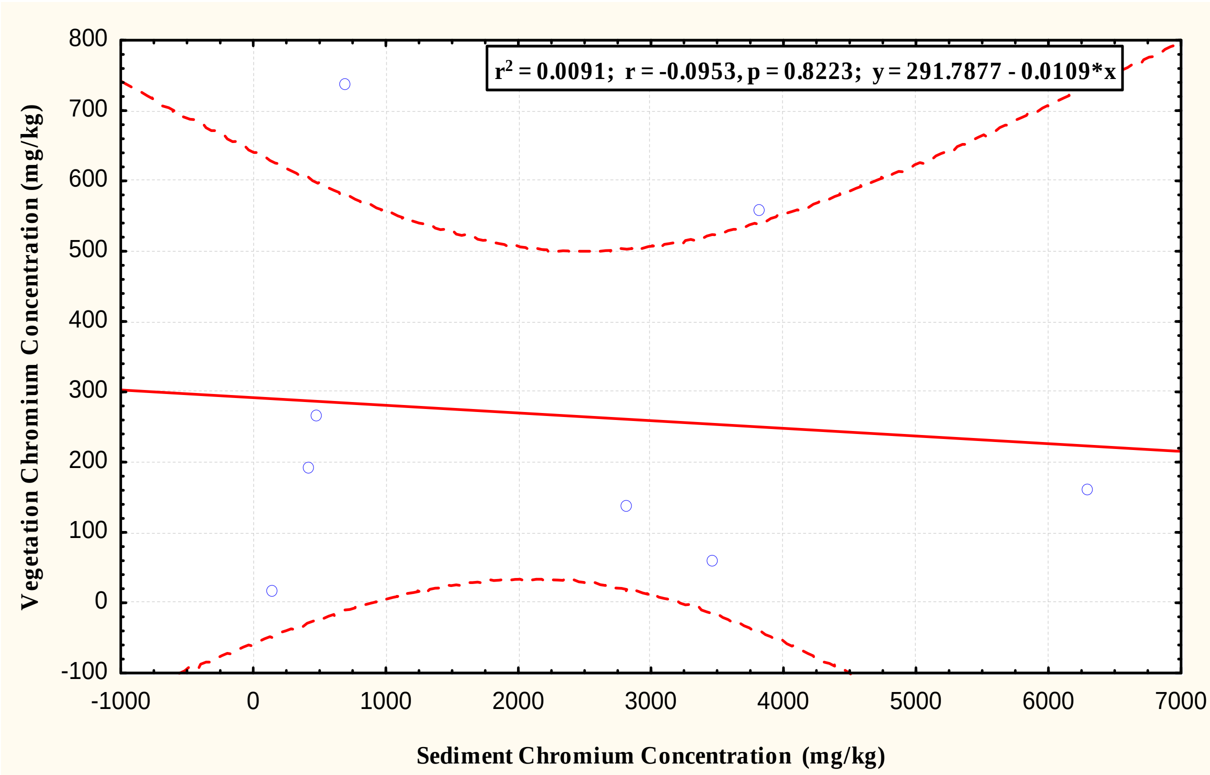


Figure E-1. Scatterplot of chromium concentrations in plants/sediment from Hudson Branch samples.

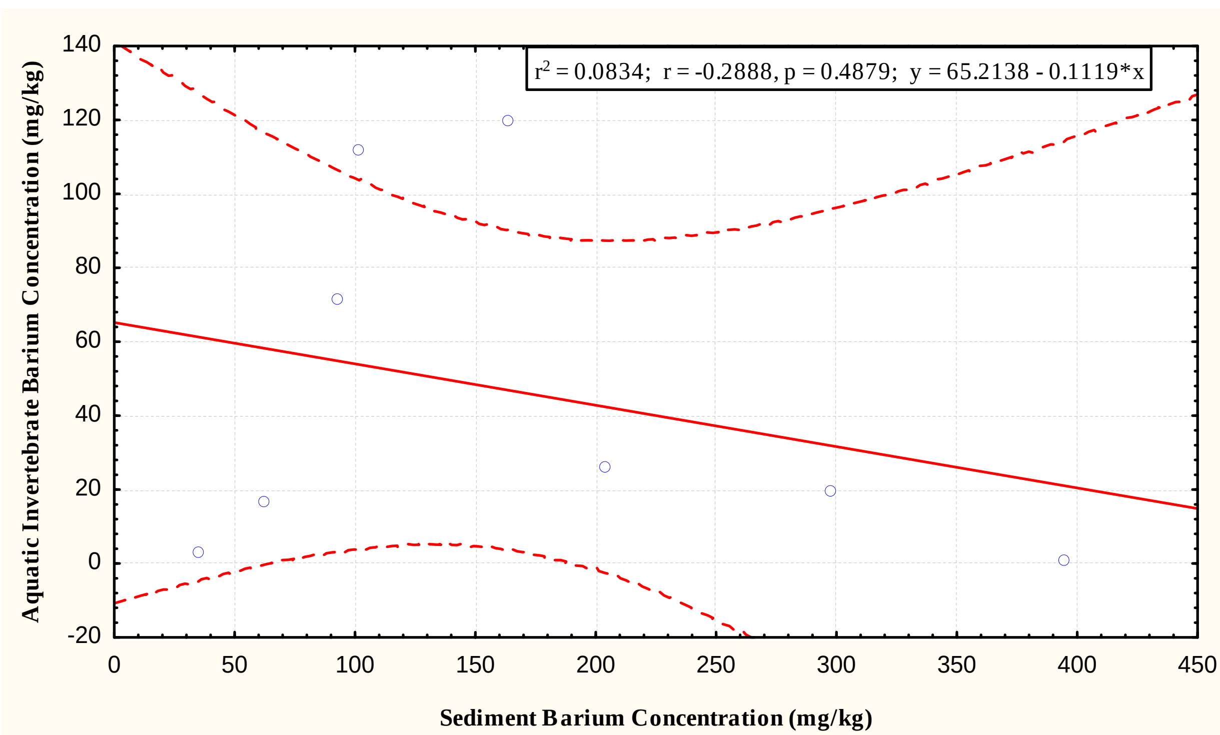


Figure E-2. Scatterplot of barium concentrations in invertebrates/sediment from Hudson Branch samples.

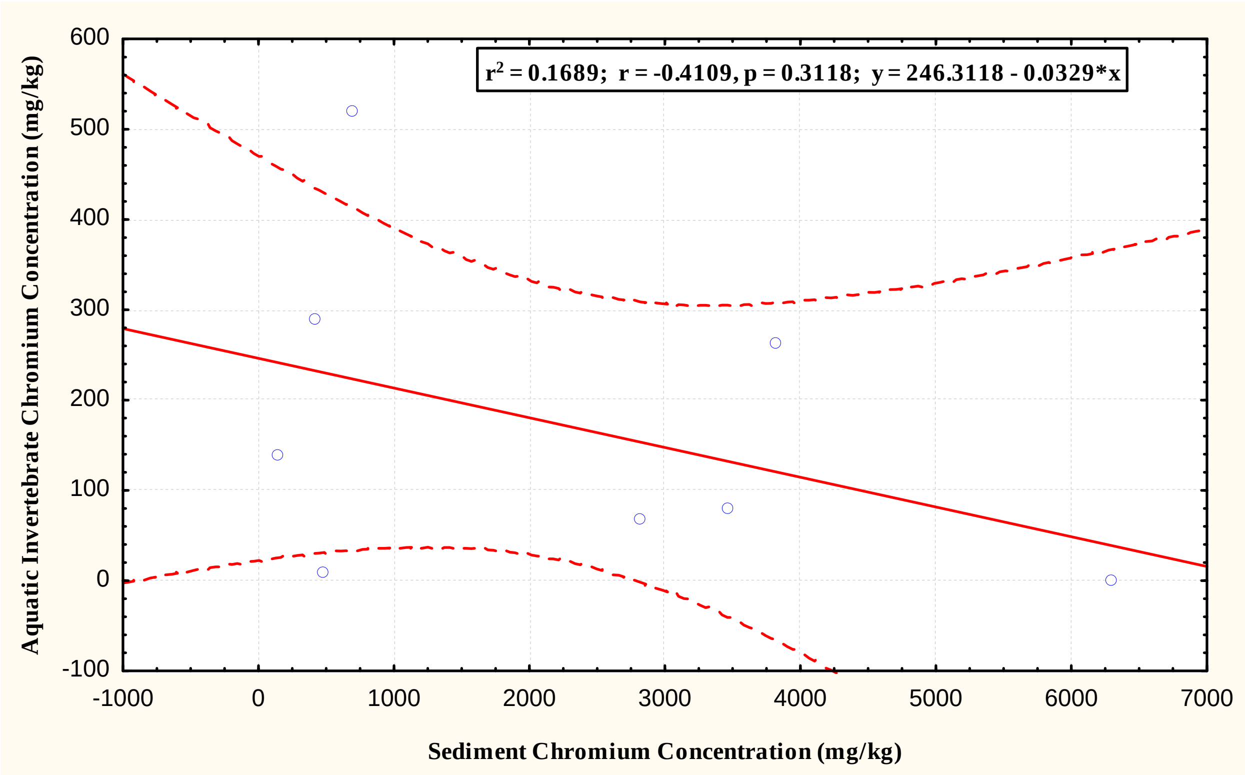


Figure E-3. Scatterplot of chromium concentrations in invertebrates/sediment in Hudson Branch samples.

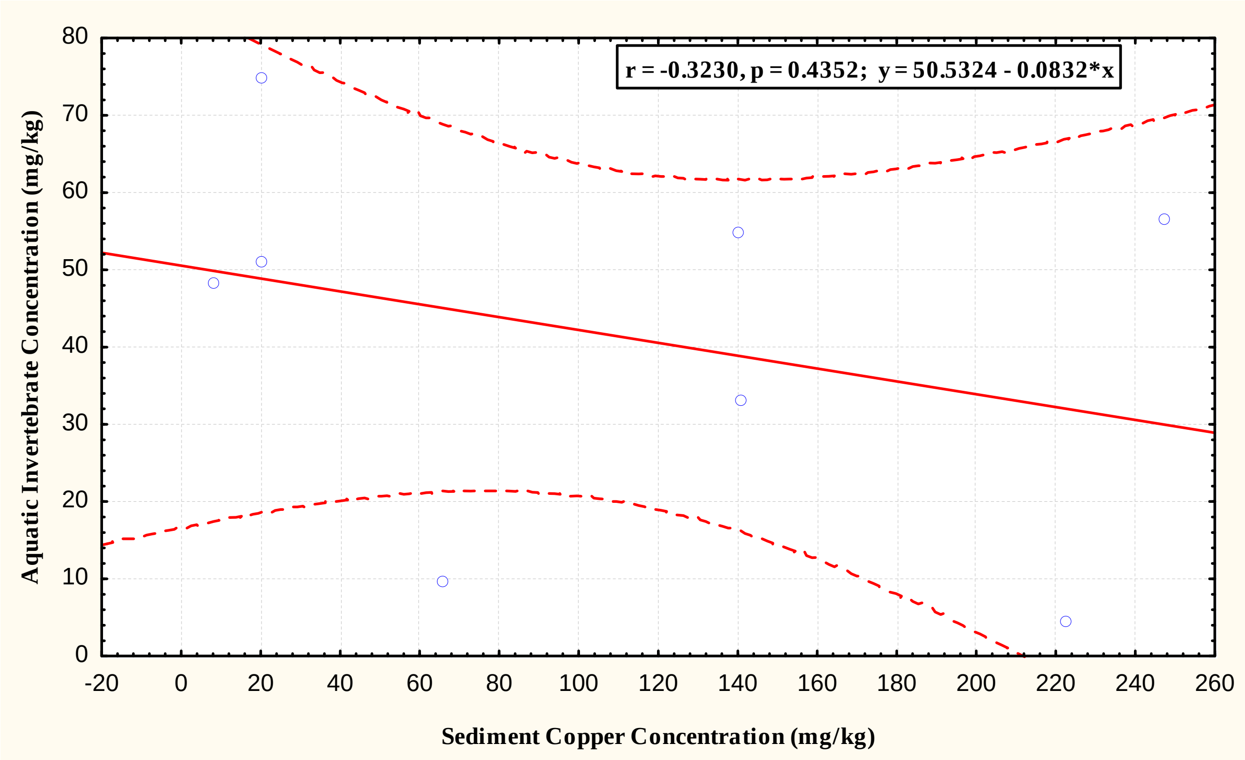


Figure E-4. Scatterplot of copper concentrations in invertebrates/sediment in Hudson Branch samples.

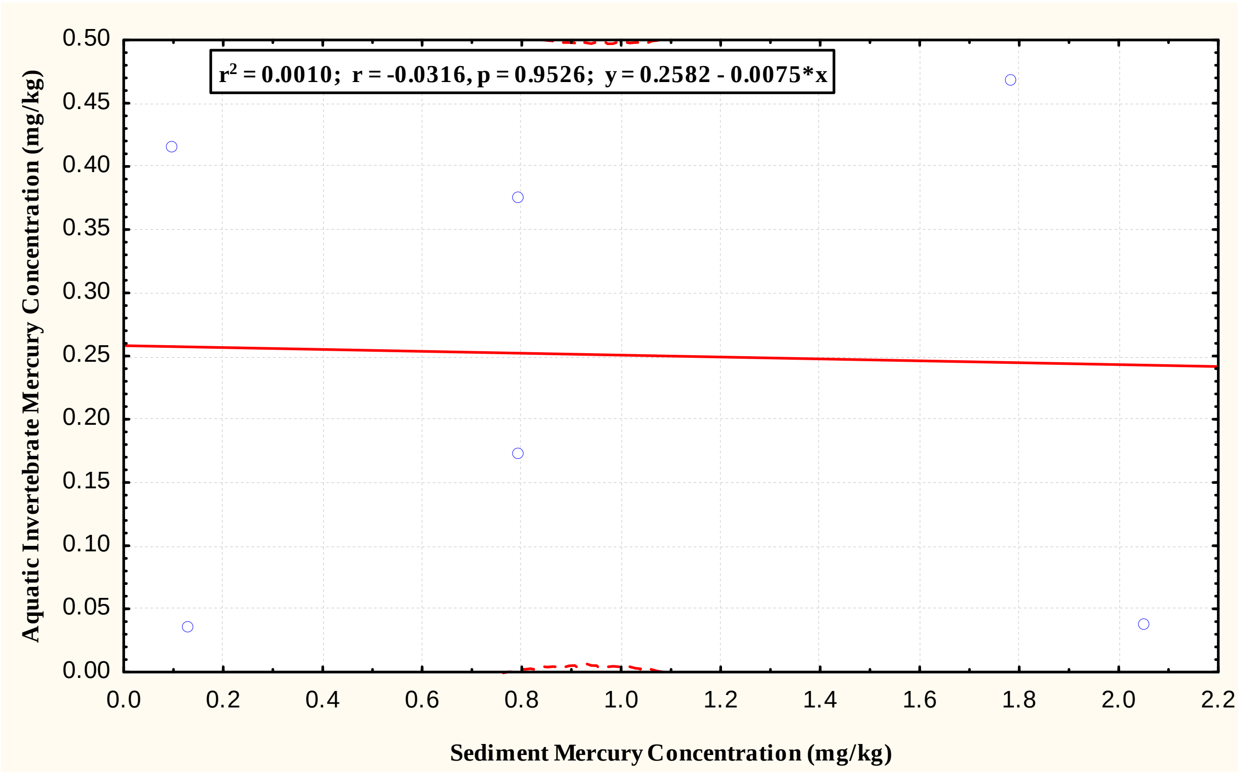


Figure E-5. Scatterplot of mercury concentrations in invertebrates/sediment in Hudson Branch samples.

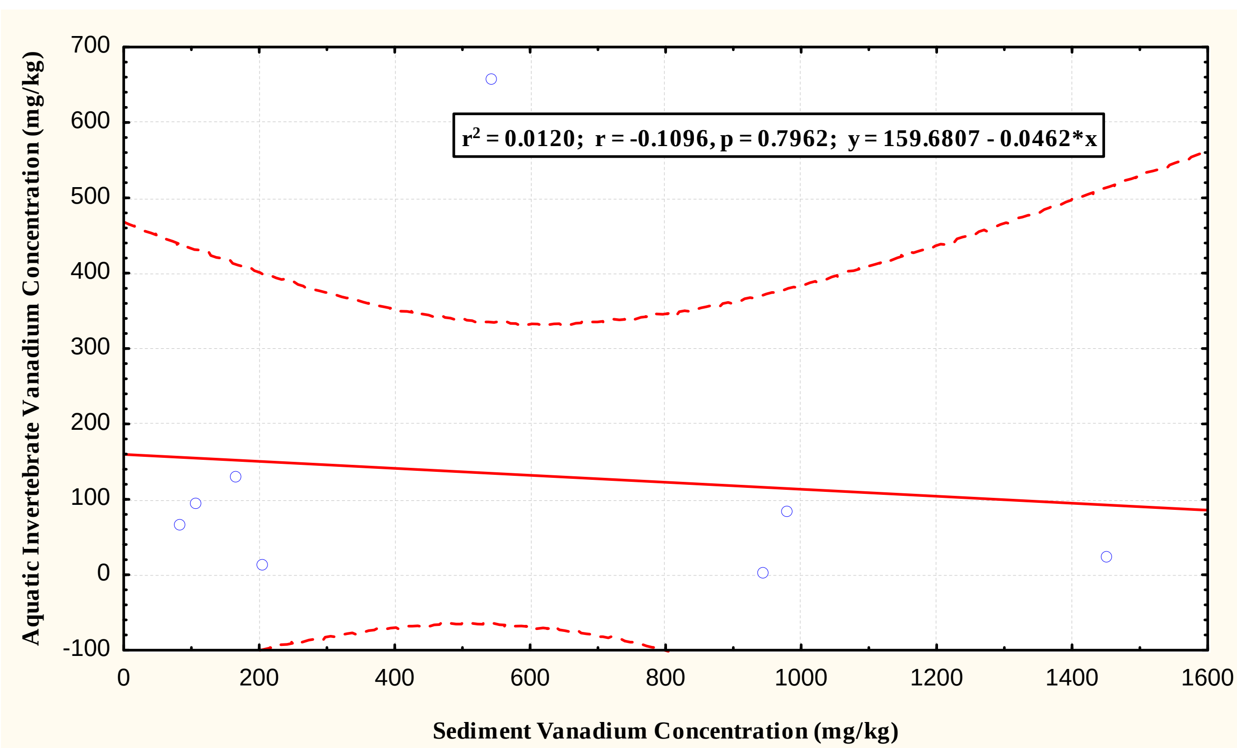


Figure E-6. Scatterplot of vanadium concentrations in invertebrates/sediment in Hudson Branch samples.

R2-0001808

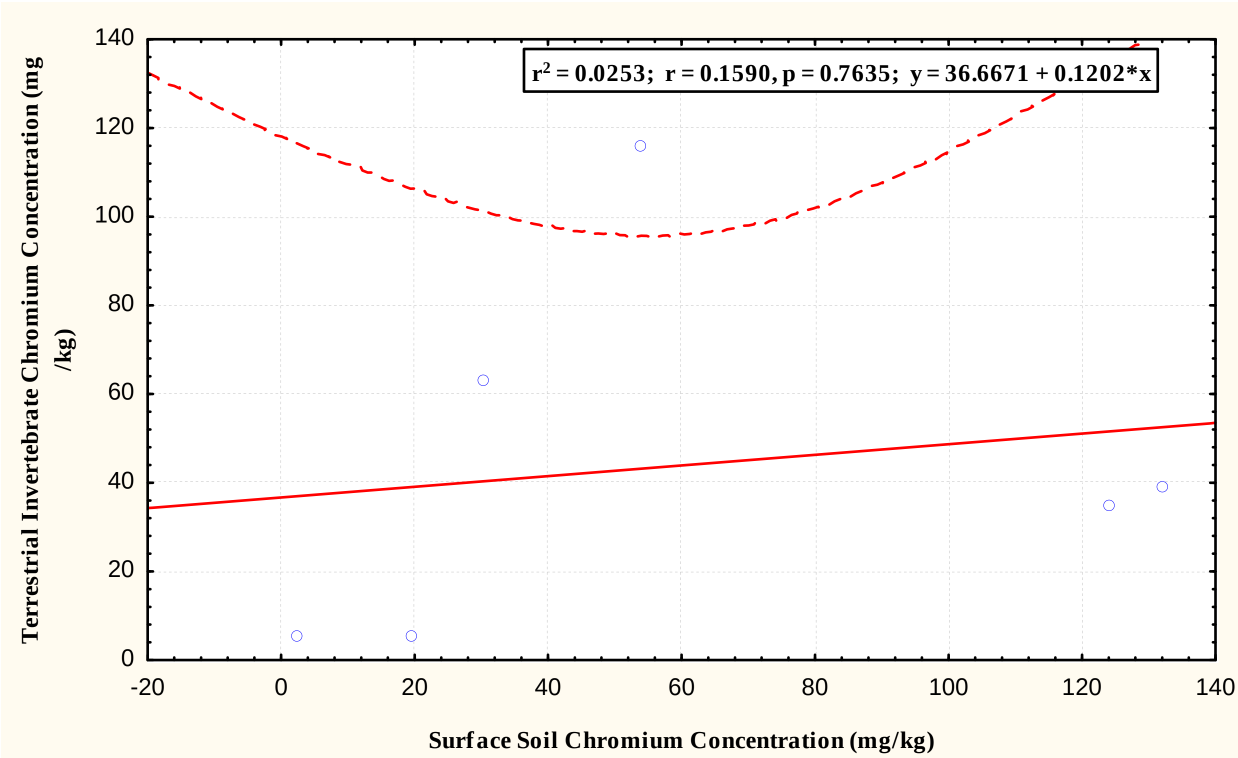


Figure E-7. Scatterplot of chromium concentrations in invertebrates/soil at Eastern Storage Area.

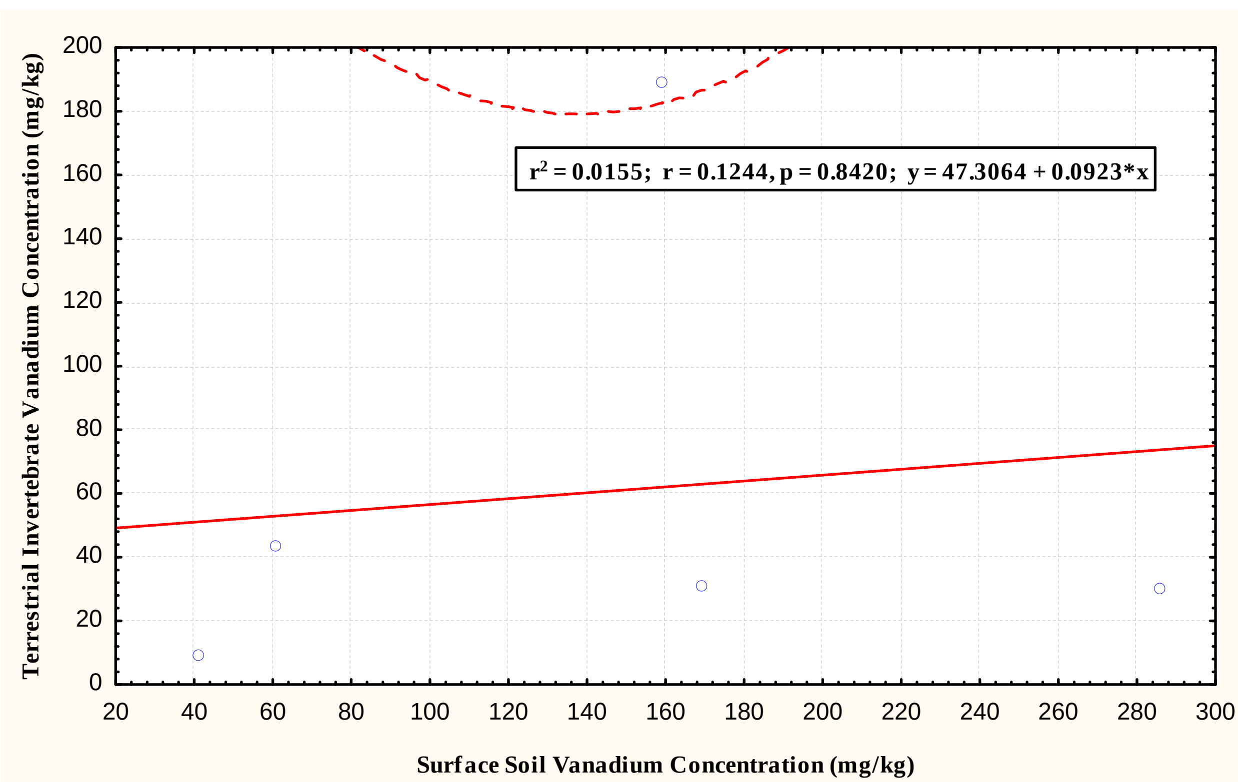


Figure E-8. Scatterplot of vanadium concentrations in invertebrates/soil at Eastern Storage Area.

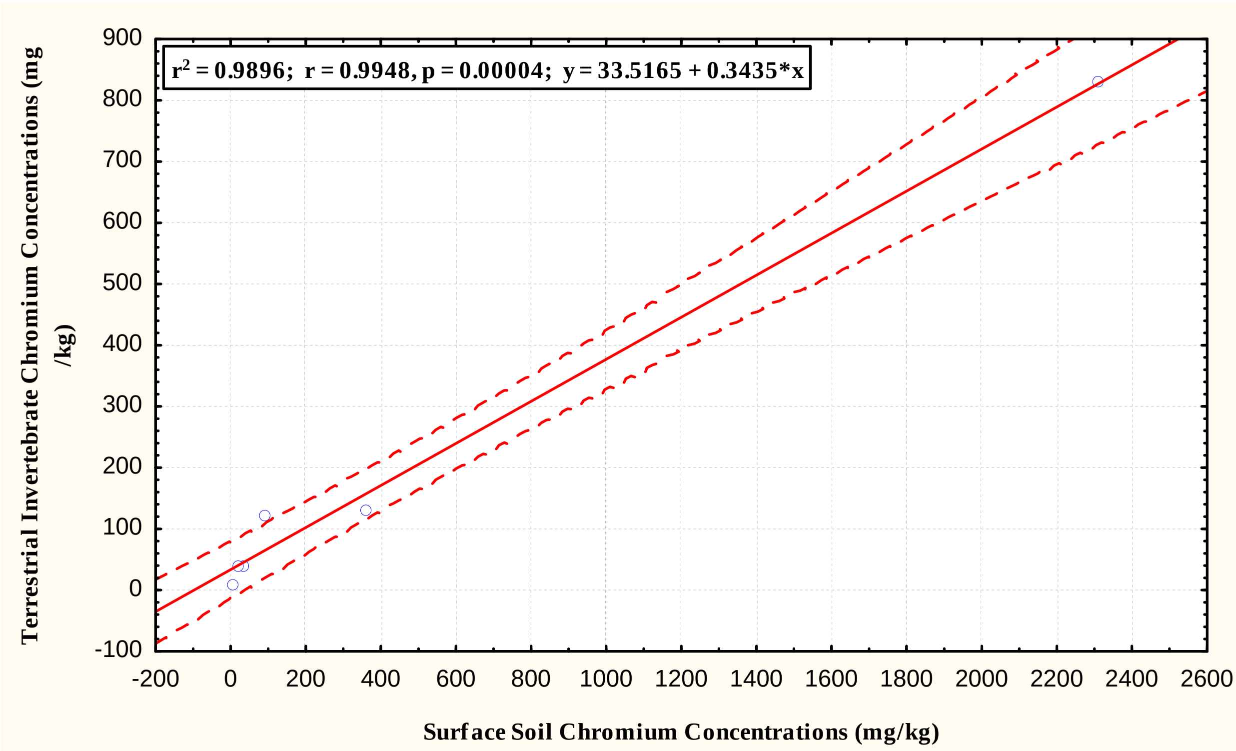


Figure E-9. Scatterplot of chromium concentrations in invertebrates/soil at Hudson Branch Wetland.

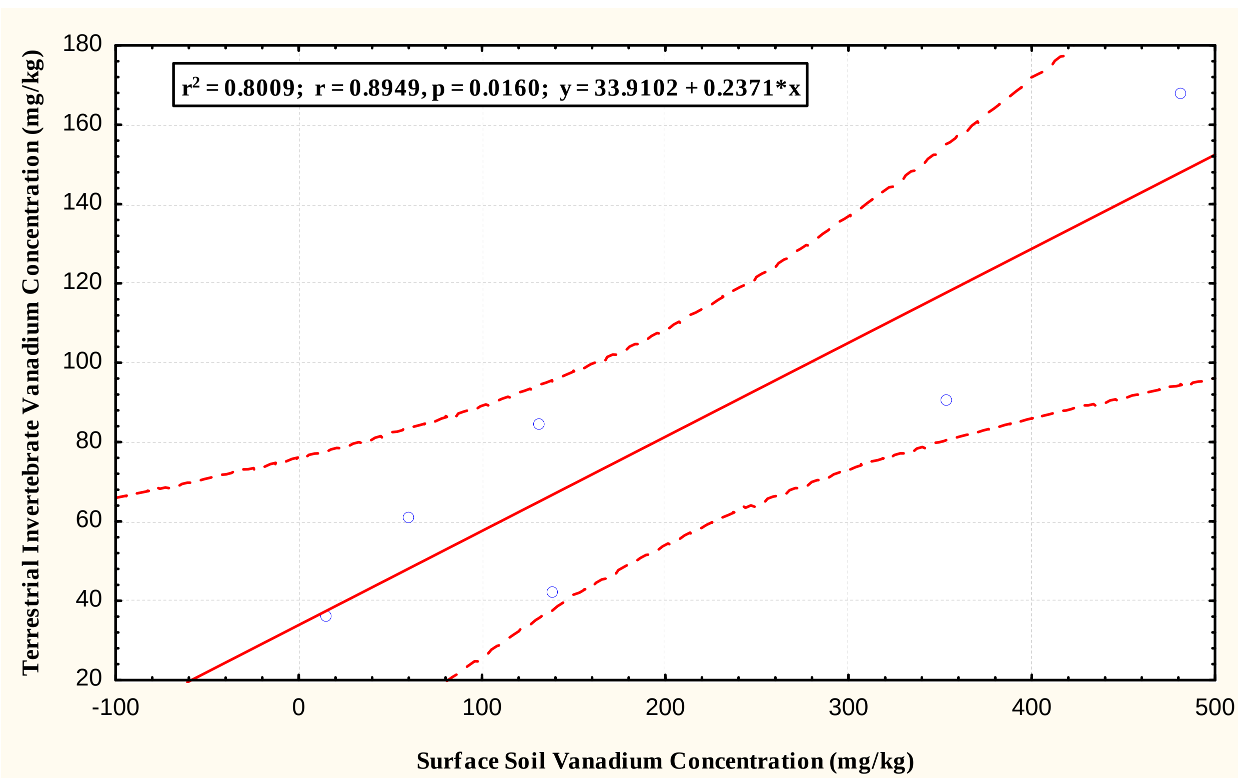


Figure E-10. Scatterplot of vanadium concentrations in invertebrates/soil at Hudson Branch Wetland.